Five-Year Review Report

Third Five-Year Review Report

for

Joslyn Manufacturing and Supply Company

City of Brooklyn Center

Hennepin County, Minnesota

July 2004

PREPARED BY:

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Date: June 30, 2004

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Date: 7/7/04

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: **Joslyn Manufacturing and Supply Company**		
EPA ID *(from WasteLAN)*: **MND044799856**		
Region: 5	**State: MN**	**City/County: City of Brooklyn Center/Hennepin County**
SITE STATUS		
NPL status: Other (Partial deletion of OU4)		
Remediation status (choose all that apply): **Operating**		
Multiple OUs?* YES	**Construction completion date: 12 / 21 / 1995**	
Has site been put into reuse? Yes		
REVIEW STATUS		
Lead agency: State		
Author name: David Douglas		
Author title: Project Manager	**Author affiliation: MN Pollution Control Agency**	
Review period:** 1 / 9 / 2004 to 7 / 22 / 2004		
Date(s) of site inspection: 2 / 2 / 2004		
Type of review: Statutory		
Review number: Third (3)		
Triggering action: Previous Five-Year Review Report		
Triggering action date *(from WasteLAN)*: **7 / 22 / 1999**		
Due date *(five years after triggering action date)*: **7 / 22 / 2004**		

* ["OU" refers to operable unit.]

Five-Year Review Summary Form, cont'd.

Issues:

The remaining soil contamination in the West Area needs to be characterized and a remedy implemented to proceed towards complete delisting of OU4.

Determine if a release of COCs from the Joslyn facility has occurred in Twin Lake, and if so, are there unacceptable risks to public health and the environment.

Recommendations and Follow-up Actions:

Complete the characterization of soil, sediment and surface water in the West Area and implementation of a remedy that is protective of human health and the environment;

Determine if a release of Site COCs from the Joslyn facility to Twin Lake has occurred, and if so, are there unacceptable risks to public health and the environment;

Continue operation and maintenance of the ground water extraction system and the DNAPL recovery system with an annual review of the status and effectiveness, with recommendations for changes as warranted;

Continue ground water and surface water monitoring with an annual review of the status and effectiveness, with recommendations for changes as warranted;

Replace, as needed, down gradient monitoring wells that were lost due to Highway 100 MnDOT reconstruction;

Update in the AMR the appropriate standards in the ARARs and TBCs as they are revised by the appropriate state or federal regulatory agency; and

Update the Environmental Restrictive Covenants for the three facility parcels after all current development has been completed.

Protectiveness Statement(s):

The ground water and DNAPL remedies are functioning as intended and are protective of human health and the environment. The ground water extraction remedy is removing COCs from the shallow and middle sands and is providing on-site containment of the contaminant plume. The DNAPL recovery system continues to remove DNAPL.

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Five-Year Review Summary Form, cont'd

The soil remedy for the delisted portion of the Site is functioning as intended and is protective of human health and the environment. Potential short- and long-term exposure to contaminated soil in the West Area is possible, but will be prevented once a remedy is implemented for the West Area.

The MPCA staff is currently investigating whether or not Site COCs have been released into Twin Lake. At the time of the review, this investigation has not been completed.

Other Comments:

The eastern two-thirds of the Joslyn Site has been redeveloped by others under actions carried out under the approval of the MPCA Superfund Voluntary Investigation and Cleanup (VIC) program. The redevelopment consists primarily of the construction of three buildings and associated parking and drive areas and the extension of Azelia Avenue. Redevelopment and/or road construction on adjacent properties have not adversely affected the on-site remedial actions. Completion of the various phases of development required cooperation and coordination between Joslyn, the city of Brooklyn Center, the developer (Real Estate Recycling, LLC), the MPCA and others.

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List of Acronyms

ACLs	Alternate Concentration Levels
AMR	Annual Monitoring Report
AOC	Administrative Order of Consent
ARARs	Applicable or Relevant and Appropriate Requirements
CCA	Chromated Copper Arsenic
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
COC	Contaminant of Concern
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	United States Environmental Protection Agency
HRL	Health Risk Level
IC	Institutional Control
LTU	Land Treatment Unit
LMCLs	Listed Maximum Concentration Levels
MCES	Metropolitan Council Environmental Services
MCLs	Maximum Contaminant Levels
MDH	Minnesota Department of Health
MERLA	Minnesota Environmental Liability and Response Act
MPCA	Minnesota Pollution Control Agency
NCP	Nation Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbons
PCP	Pentachlorophenol
PLP	Permanent List of Priorities
POTW	Publicly Owned Treatment Works
PRP	Potentially Responsible Party
RA	Remedial Action
RAGS	Risk Assessment Guidance for Superfund
RAL	Recommended Allowable Limit
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SDWA	Safe Drinking Water Act
TBCs	To be Considereds
VIC	Voluntary Investigation and Cleanup
SVOCs	Semi-Volatile Organic Compounds
WasteLan	The Regional database related to CERCLIS

Executive Summary

The Joslyn Manufacturing and Supply Company (Joslyn) Site (Site) consists of four operable units. Operable Unit 1 (OU1) consists of the upper unit of the unconsolidated aquifer (shallow upper aquifer); OU2 consists of the middle unit of the unconsolidated aquifer (middle sands); OU3 consists of the dense non-aqueous phase liquid (DNAPL) pool located near W251; and OU4 consists of contaminated soil. The remedy included on-site biological treatment of contaminated soil (or the offsite disposal of heavily contaminated soil – soil unable to be treated biologically); operation and maintenance of the ground water pumpout system; operation and maintenance of a DNAPL pumpout system; and regional ground water and surface water monitoring.

The ground water extraction remedy for OU1 and OU2 is removing contaminants of concern (COCs) from the shallow and middle sands and is providing on-site containment of the contaminant plume. The DNAPL recovery system for OU3 continues to remove DNAPL. The ground water and DNAPL remedies are functioning as intended and are protective of human health and the environment.

The soil remedy was completed for the OU4 portion of the Site that was redeveloped during 1999-2004 and that was partially delisted from the Permanent List of Priorities (PLP) – the state Superfund list and the National Priorities List (NPL). The West Area portion of OU4 has not yet been delisted and the area is currently under investigation for releases of pentachlorophenol (PCP), polynuclear aromatic hydrocarbons (PAHs) and dioxins/furans. The West Area has been fenced as an interim security precaution to limit access by individuals until a remedy can be implemented. The Minnesota Pollution Control Agency (MPCA) staff has posted signs on the West Area fence to warn individuals of the contamination that exists in the West Area. The soil remedy for the delisted portion of OU4 is functioning as intended and is protective of human health and the environment. Potential short- and long-term exposure to contaminated soil in the West Area is possible but will be prevented once a remedy is implemented for the West Area.

The MPCA staff is currently investigating whether or not Site Contaminants of Concern (COCs) have been released into Twin (Middle Bay) Lake (Twin Lake). At the time of the review, this investigation has not been completed.

FIVE-YEAR REVIEW REPORT

Joslyn Manufacturing and Supply Company
Brooklyn Center, Minnesota

I. INTRODUCTION

The purpose of the Five-Year Review is to determine whether the remedy at the Joslyn Manufacturing and Supply Company Site is protective of human health and the environment. The methods, findings and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to CERLA Section 121 and the National Contingency Plan (NCP). CERLA Section 121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to ensure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such actions.*

The Agency interpreted this requirement further in the NCP; 40 CFR Section 300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.*

The MPCA staff has completed a Five-Year Review of the Remedial Actions (RAs) conducted at the Joslyn Site in Brooklyn Center, Minnesota. This Five-Year Review evaluates whether the RA remains protective of public health, welfare, and the environment and was conducted from January 2004 through July 2004.

This review focuses on the protectiveness of the Joslyn Site RA 16 years from the time the RA commenced in 1988. This is the third Five-Year Review completed by the MPCA staff. The first Five-Year Review was completed by the MPCA staff on December 28, 1995 and the second was completed by the MPCA staff on July 22, 1999.

II. SITE CHRONOLOGY

Table A: Chronology of Site Events

Date	Event
1920's–1980	Site was used for wood treating.
9/27/1983	MPCA issued a Request for Response Action (RFRA) to Joslyn.
9/21/1984	Site was listed by EPA on the NPL.
5/30/1985	MPCA and Joslyn entered into a Response Order by Consent (Consent Order) to perform an investigation.
1988	Site soil remediation was initiated with the implementation of the Interim Response Action which consisted of the removal of 18,818 tons of contaminated soil.
2/1989	The ground water pumpout system at OU1 and OU2 began operation.
7/31/1989	Site Record of Decision (ROD) was issued by MPCA.
1989 – 1997	Land Treatment Unit (LTU) was constructed and soil treatment occurred from 1989 through 1997.
12/1995	The DNAPL recovery system (OU3) began operating.
12/28/95	Completion of the first Five-Year Review.
10/8/1996	MPCA staff established the industrial land use scenario for the Site.
3/24/1999	MPCA staff completed the Human Health Limited Risk Assessment (LRA).
7/22/1999	Completion of the second Five-Year Review.
5/2000	Completion of the institutional controls for the portion of OU4 delisted from the PLP; consists of a Declaration of Restrictions and Covenants.
6/01/00	Partial delisting of OU4 from PLP.
12/2001	Completion of OU4 cover – Grids I1, J1, K1, and L1.
8/16/02	Partial delisting of OU4 from NPL.
Ongoing	Submittal of Annual Monitoring Reports (AMRs) to the MPCA for review and approval.

III. BACKGROUND

Physical Characteristics

The Joslyn Site is located within the city limits of Brooklyn Center in Hennepin County, Minnesota (Figure 1). The Joslyn Site is now divided into two discrete areas: the 25-acre portion of the Site that has been delisted and redeveloped for commercial use and the 11-acre West Area (Figure 2). The redevelopment of the eastern portion of the Site has occurred in the last five years. The westernmost portion of the Site, the West Area, remains undeveloped. Twin Lake borders the western perimeter of the West Area of the Joslyn Site.

Adjacent Land and Resource Use

Twin Lake is located to the west, a railroad track borders the north property perimeter with residential and light commercial to the north of the railroad tracks, Highway 100 is located to the east and residential and commercial properties are located to the south.

History of Contamination

The Site was used for wood treating from the 1920s until its closure in 1980. The wood treating process began with a creosote thermal process; in 1965 it changed to a pressure treating process with PCP and a water-soluble process using chromated copper arsenic (CCA). Waste from these processes was placed in waste disposal ponds on the Site. Process sludge was buried on the Site. In the 1950's and 1960's, wood-treating solution spills occurred at the Site.

The primary COCs at the Site are the following wood-treating chemicals: PCP; carcinogenic polynuclear aromatic hydrocarbons (cPAHs); and noncarcinogenic PAHs (nPAHs). The PAHs are constituents of creosote. These COCs were identified in the Site ROD.

In 1961, Brooklyn Center staff found several nearby residential wells contaminated by phenols. In 1980, the MPCA staff found PCP and phenols in several nearby residential wells. Studies conducted by Joslyn showed soil and ground water of the Site contaminated by PAHs, PCP, and CCA.

On September 27, 1983, the MPCA issued a RFRA to Joslyn pursuant to the Minnesota Environmental Response and Liability Act (MERLA) requesting that Joslyn undertake remedial actions to abate the release of hazardous substances at the Site. On September 21, 1984, the Site was listed by EPA on the NPL due to extensive soil and ground water contamination. On May 30, 1985, the MPCA and Joslyn entered into a Consent Order to continue the investigation and cleanup of the Site. The Site ROD was issued July 31, 1989. On October 8, 1996, using EPA guidance and a report produced by Joslyn in cooperation with the city of Brooklyn Center, the MPCA staff established the reasonably anticipated land use to be industrial for the portion of the Site that was developed. The West Area is currently zoned industrial.

Initial Response

Ground Water

Two aquifers have been identified at the Site. The upper unconsolidated aquifer is a surficial sand aquifer that extends from the ground surface to depths of 30 to 80 feet and is comprised of OU1 and OU2 (the shallow and middle sand units). The lower aquifer consists of the St. Peter Sandstone, the Prairie du Chien Group, and a buried sand and

gravel unit overlying these bedrock units (Figure 3 is the reference plan view for Figures 3a and 3b that show the geologic cross-sections).

The upper unconsolidated aquifer is divided into a shallow and a middle sand unit. A middle confining unit consisting of a sequence of stratified sand, silt, and clay separates the upper and lower aquifers below approximately the eastern two-thirds of the Site. A buried bedrock valley is located below the western one-third of the Site. The bedrock valley is filled with sand. The middle confining unit is not present in the bedrock valley.

Ground water in the upper aquifer moves generally to the east, eventually discharging to the Mississippi River. Seepage from Twin Lakes recharges the upper aquifer upgradient of the Site. The water table surface is 10 to 15 feet below the ground surface over most of the Site. The saturated portion of the upper aquifer ranges from 20 to 45 feet in thickness. The average rate of lateral ground water movement in the upper aquifer is in the range of 250 to 1,000 feet per year.

A drain tile beneath Highway 100, which is east or downgradient of the Site, periodically intercepts the shallow upper aquifer. The drain tile location is shown on Figure 4. This intercepted ground water is transported along with stormwater from the highway and other urban areas to Shingle Creek.

The upper and lower aquifers are separated by a confining unit that consists of fine-grained units (clays and silts). Within this confining layer are discontinuous sand units referred to as the middle sands. The thickness of the middle confining unit varies from 10 to 60 feet beneath the Site. Vertical movement of water through the confining unit is estimated to be very low (0.4 to 0.004 feet per year) due to the small pressure difference across the unit (approximately 2.5 feet) and the low permeability of the unit (approximately 10^{-5} centimeters/second).

The lower aquifer beneath the eastern portion of the Site consists of the St. Peter Sandstone and the Prairie du Chien Group along with the overlying thin stratum of sand and gravel. A downward vertical water level difference of two to three feet is present between the upper aquifer and the lower aquifer beneath the eastern portion of the Site. The direction of ground water flow in the lower aquifer is also towards the Mississippi River. The horizontal ground water velocity in the St. Peter Sandstone is estimated to be in the range of 50 to 200 feet per year.

The middle confining unit and the St. Peter Sandstone are not present below the western one-third of the Site. These units have been removed by glacial action, creating a north-south trending buried bedrock valley cutting into the Prairie du Chien Group. The middle confining unit and the St. Peter Sandstone have been replaced in this valley by an outwash of sand and gravel. The vertical rate of ground water movement through the outwash is likely greater than the vertical rate of movement through the middle confining unit, although only a small downward vertical gradient can be measured in the valley.

At the time the ROD was written, the following ground water conditions existed:

- Shallow Upper Aquifer: Sample analysis from wells placed in the shallow upper aquifer documented the presence of a plume of PCP and PAH compounds extending approximately 2,000 feet downgradient of the Site (Figure 9).

- Middle Sand Portion of Upper Aquifer: Sample analysis from wells placed in the middle sands portions of the upper aquifer documented the presence of PCP and PAH compounds.

- Lower Aquifer: Sample analysis from wells placed in the lower aquifer show no detectable PCP and low levels of PAH compounds.

- Highway 100 Drain Tile: The drain tile was not intercepting ground water because of a drought that depressed the water table.

Soil

Remediation of the Site soil began in 1988 with an Interim Response Action when Joslyn excavated, shipped, and disposed of 18,818 tons of contaminated soil, classified as K001 hazardous waste, in a permitted hazardous waste landfill in Oklahoma. During the remedial investigation, the nature and extent of most of the contaminated soil was determined. Most of the contaminated soil was located in the vicinity of the former operating areas of the facility and beneath the former wastewater disposal ponds. Not including the soil removed during the Interim Response Action (1988 prior to 1989 ROD), it was estimated that 40,000 to 70,000 cubic yards of soil requiring treatment remained on-site. Contaminated soil was defined based upon visual appearance and on the results of analyses of representative soil samples.

Surface Water

There are several surface water bodies in the vicinity of the Site. Twin Lake and a small wetland area are located along the western border of the Site. Ryan Lake, Ryan Creek, Shingle Creek, and the Mississippi River are all within two and one-half miles east and downgradient of the Site. Ground water flows across the Site from Twin Lake to the east-southeast toward the Mississippi River. Ground water from the Site does not impact the surface water of Twin Lake. In the early 1980s, EPA and Joslyn collected and analyzed surface water samples of Twin Lake to investigate potential impacts of surface runoff. Results indicated the absence of PCP and suggested other sources of low level PAHs. The MPCA staff concluded that Ryan Lake and Ryan Creek would likely not be impacted by Site contamination because they lie above the water table downgradient of the Site.

The ROD noted that the Site could potentially affect Shingle Creek. Shingle Creek receives water from a storm sewer system that is connected to a drain tile that drains the

roadway subsurface of Highway 100 at a location downgradient of the Site. At the time the ROD was written, regional ground water levels were lower than normal due to a dry-weather pattern and the drain tile was not intercepting ground water.

Basis For Taking Action

Hazardous substances that have been detected in each media include:

Soil	Ground Water
PCP	PCP
PAHs	PAHs
Arsenic	Arsenic
Copper	Copper
Chromium	Chromium
Dioxins/Furans*	

* Compounds were not identified in the ROD but have been detected in subsequent sampling and analysis.

IV. REMEDIAL ACTIONS

REMEDY SELECTION

Section X of the ROD describes the remedial objectives of the remedy. The ROD specified that the main objectives of remediation were to abate and minimize the potential adverse health impacts of contaminated soils, to prevent the continued migration of PAHs and PCP from the Site into the ground water, and reduce the concentrations of PAHs and PCP in the upper aquifer to drinking water standards, thereby protecting the lower aquifer.

The ROD divided the Site into four operable units. OU1 consists of the upper unit of the unconsolidated aquifer (shallow upper aquifer); OU2 consists of the middle unit of the unconsolidated aquifer (middle sands); OU3 consists of the DNAPL pool located near W251; and OU4 consists of contaminated soil.

Ground Water/Operable Units 1, 2, and 3

The ROD specified that the selected remedy included:

a. installation of seven pumpout wells to remove contaminated ground water and one or more oil recovery wells to remove free oil on the water table surface in the shallow aquifer to prevent downward and lateral migration of contaminants;

b. installation of two pumpout wells to remove contaminated ground water in the middle sand aquifer and prevent downward migration of contaminants;

c. pumpout of DNAPL and contaminated ground water in the depression area of the upper aquifer near well 251 using two or more wells;

d. operation and maintenance of the pumpout system, DNAPL recovery system, LTU, and ground water monitoring; and

e. installation of one or more additional monitoring wells to determine the capture zone of the ground water pumpout system and to evaluate the effectiveness of the LTU in removing contaminants from soil.

The ROD states that ground water will be pumped until the ground water concentrations have been reduced to 0.028 micrograms per liter (ug/l) cPAH, 0.28 ug/l nPAH, and 220 ug/l PCP, which were the Minnesota Department of Health's (MDH) Recommended Allowable Limits (RALs). The ROD indicates that the cPAH cleanup level is a 10^{-5} cancer risk.

The ROD states that the extracted ground water will be pretreated with an oil-water separator and discharged to the sanitary sewer system for treatment.

The ROD established no cleanup limits for removal of DNAPL. Instead the ROD stated that the "...cleanup goal will be to remove as much DNAPL as practical with the limits of available technology and cost effectiveness."

Soil/Operable Unit 4

The ROD specified that the selected remedy included:

a. excavation and offsite disposal of highly contaminated soil at a permitted hazardous waste landfill;

b. excavation and land treatment of remaining soil onsite; and

c. revegetating the site to prevent fugitive dust emissions.

Biological treatment of contaminated soil was the remedy selected in the ROD. The 1988 Interim Response Action addressed the most heavily contaminated soil (soil that may have inhibited biological treatment). The ROD addressed the "remaining" contaminated soil. The RA described in the ROD included a contingency for offsite disposal of additional heavily contaminated soil.

The contaminated soil left onsite was to be treated by batched bioremediation in a Land Treatment Area (LTA) (later called a Land Treatment Unit (LTU) until Joslyn reached the

soil treatment goal of less than 100 milligrams per kilogram (mg/kg) or parts per million (ppm) cPAHs and less than 150 ppm PCP.

The objective of treating contaminated soils was to reduce the toxicity and mobility of COCs on the Site and decrease the potential for COCs to leach from soil to ground water. Exposure to treated soil was to be eliminated by proper closure of the LTU.

Surface Water

There were no response objectives identified in the ROD related to surface water. The ROD required Joslyn to check the drain tiles under the Highway 100 underpass to determine whether or not the tile was intercepting ground water, and if so, the water was to be sampled to determine water quality and assess the impacts on surface water. If the water was adversely impacted from the Site, additional remedial actions may be required or the water may need to be pumped to the ground water treatment system.

The ROD listed Aquatic Life Criteria (ALC) that were to be used to assess the impacts on surface water. The ALC given in the ROD were 5/7.8 ug/l for PCP, 0.07 ug/l for cPAHs, and 0.17 ug/l for nPAHs. The ALC of 5/7.8 ug/l for PCP as stated in the ROD appears to be in error. The concentration for PCP should have been listed as 5.7 ug/l at a pH of 7.

Lower Aquifer

There were no response objectives identified in the ROD for the lower aquifer. However, the ROD stated that additional response actions would be required for the lower aquifer if "1. ground water quality in monitoring wells exceeds the RAL for the sum of cPAH or; 2. the RAL for the sum of nPAH is exceeded and detection limits for cPAH exceeds the RAL for cPAH (.028 ug/l)."

ARAR REVIEW

The five-year review is being conducted to determine whether the site RAs remain protective of public health and the environment. The more specific purpose of the review is two-fold: (1) to confirm that the remedy as spelled out in the ROD and/or remedial design remains effective at protecting human health and the environment (e.g., the remedy is operating and functioning as designed, institutional controls are in place and are protective), and (2) to evaluate whether original cleanup levels remain protective of human health and the environment. Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs) are key elements in fulfilling these two purposes.

Ground Water/Operable Units 1, 2, and 3

Ground Water ARARs Cited in ROD

1. Clean Water Act (CWA) 40 CFR Parts 122 and 125

Treated ground water discharged to the Metropolitan Council Environmental Services (MCES) sanitary sewer system is regulated through the requirements of a National Pollutant Discharge Elimination System (NPDES) permit. Treated ground water must meet the requirements of the permit to be discharged into the MCES system.

The MCES permit, effective from November 1, 2003 through October 31, 2006, was finalized on November 3, 2003. The permit requires the collection and analysis of quarterly samples from the discharge from the oil water separator tank. The quarterly samples are analyzed for pH, total suspended solids (TSS), chemical oxygen demand (COD), PCP and PAHs. The permit states that the concentration of any one toxic organic parameter can not exceed 3 milligrams per liter (mg/l) and the combined total toxic organics concentration can not exceed 10 mg/l.

The permit requires that the sample collected during the January – March 2004 quarter must also be analyzed for 2,3,7,8 – tetrachloro-dibenzo-p-dioxin (2,3,7,8-TCDD) using EPA Method 613. The discharge criteria for 2,3,7,8-TCDD is less than (<) 0.002 ug/l.

2. Safe Drinking Water Act (SDWA) (40 CFR Parts 141 - 146)

This ARAR establishes federal maximum contaminant levels (MCLs) for contaminants in public drinking water supplies.

The ROD states that the Site will impact no drinking water supplies; however, the ground water remediation goal is to restore the aquifer to drinking water quality. Since no public drinking water supplies were impacted and no MCLs existed for Site COCs at the time the ROD was written, the ROD specified RALs as cleanup goals for ground water. RALs are used by the MPCA as cleanup criteria for private drinking water supplies and represent the 10^{-5} level for carcinogenic contaminants. RALs were never promulgated standards; therefore, RALs should have been considered TBCs in the ROD. RALs have since been superseded by MDH Health Risk Limits (HRLs), which are promulgated standards (see Item 5 below).

3. Minn. Stat. ch. 105

This ARAR establishes the need for Joslyn to be issued a Water Appropriation Permit from the Minnesota Department of Natural Resources (MDNR) in order to operate the ground water pumpout system.

Joslyn has two Water Appropriation Permits from the MDNR. Permit 886341 is for pumpout wells W253 and W255, which pump water from OU2. Permit 886342 is for multiple pumpout wells that pump water from OU1. The 2003 Annual Report of Water Use was submitted to the MDNR on February 11, 2004.

Ground Water ARARs Not Cited in the ROD

4. Minn. Stat. chs 115 and 116 and Minn. R. chs. 7001 and 7050

These ARARs regulate the discharge of the treated water to the Mississippi River under an NPDES permit and should be thought of as reinforcing the Clean Water Act.

5. Minn. R. 7050.0220

This ARAR requires that discharges to ground water that will be used for consumption attain MCLs for public drinking water supplies and water quality standards such as HRLs for contaminants in private drinking water supplies. No public drinking water supplies are impacted by Site COCs. This ARAR should be thought of as reinforcing the concept of using RALs as cleanup criteria.

The ROD required that the ground water pumpout system continue operation until the ground water beneath the Site complies with the RALs for the COCs which the ROD identified as 220 µg/l PCP; 0.028 µg/l cPAHs; and 0.28 µg/l nPAHs.

In early 1993, the MDH discontinued the use of RALs and promulgated new HRLs. HRLs are based upon a 10^{-5} human health risk factor and are required to be used in evaluating human health risk for contaminated ground water from private drinking water supplies. By agreement between the MDH and MPCA, MPCA staff is allowed to use HRLs as ground water cleanup criteria. HRLs should be considered TBCs for ground water at the Site.

HRLs for individual chemicals may not account for the possible interaction of multiple chemicals that are each present at a concentration below its health risk limit. The mixture provision applies an additive model to address mixtures of chemicals. A mixture hazard index of greater than 1.0 indicates that the mixture exceeds the health risk limit.

HRLs for total cPAHs and nPAHs do not exist. Instead, individual HRLs have been developed for some nPAHs, but no cPAHs. In addition to HRLs, the MDH has developed health-based values (HBVs) for several chemicals in drinking water. HBVs are not promulgated and, therefore, are regarded as TBCs.

In evaluating human risk associated with cPAHs, the MDH developed a HBV for benzo(a) pyrene of 0.05 µg/l. To assess risk for other cPAHs and to determine a cumulative risk for total cPAHs, a relative potency factor is used based on the HBV for benzo(a)pyrene. EPA's "Provisional Guidance for Quantitative Risk Assessment of

Polycyclic Aromatic Hydrocarbons" (EPA/600/R-93/089-July 1993) should be used as a reference for relative potency factors for cPAH compounds other than benzo(a)pyrene. The relative potency factors should be applied to calculate benzo(a)pyrene equivalents and the resulting equivalency concentration are then compared to the HBV for benzo(a)pyrene. Since the cPAH relative potency factors are not media specific, it is appropriate to apply these factors to ground water as well as soil. The numbers developed are indicated in Table 1 and include the applicable expanded list cPAHs. The MPCA staff has requested that Joslyn incorporate the expanded list cPAHs into the calculation and the evaluation of the Site conditions.

Currently, the equivalent ground water cleanup requirements for those cited above from the ROD are: the HRL of 3 ug/l for PCP; the benzo(a)pyrene equivalence for the suite of cPAHs present evaluated against an acceptable benzo(a)pyrene equivalence of 1.0; and individual HRLs for nPAHs present.

6. Minn. R. 4717.7100 to 4717.7800

These ARARs establish HRLs for ground water contaminants. These ARARs should be viewed as reinforcing the concept of returning the ground water to potability.

Minn. Rule 4717.7700 provides the procedure for determining if the health risk limit for a mixture of carcinogens is exceeded. To determine a hazard index for chemicals with a toxic endpoint of cancer, use the following equation:

Hazard index = (Ec1/HRLc1) + (Ec2/HRLc2) + ... + (Ecn/HRLcn)

where Ecn represents the concentration of the first, second, . . . nth carcinogen detected in ground water and HRLcn represents the health risk limit of the first, second, . . . nth carcinogen. A hazard index of 1 indicates a lifetime risk level of one in 100,000. A hazard index of 1 equals the health risk limit. A hazard index of greater than one exceeds the health risk limit.

Minn. Rule 4717.7500 provides the procedure for determining if the health risk limit for a mixture of systemic toxicants (noncarcinogens) is exceeded. To determine if the health risk limit for a mixture of systemic toxicants is exceeded, a hazard index must be calculated using the following procedure.

The chemicals detected in the ground water must be grouped by toxic endpoint as specified in part 4717.7650. When two or more chemicals have the same toxic endpoint, a hazard index must be determined for each group of chemicals with the same toxic endpoint using the following equation:

Hazard index = (Est1/HRLst1) + (Est2/HRLst2) + ... + (Estn/HRLstn)

where Estn represents the concentration of the first, second, . . . nth systemic toxicant detected in ground water and HRLstn represents the health risk limit of the first, second, . . . nth systemic toxicant. A hazard index of 1 equals the health risk limit. A hazard index of greater than one exceeds the health risk limit.

7. Minn. R. 7060.0500

This ARAR reads as follows, "[i]t is the policy of the agency that the disposal of sewage, industrial waste, and other wastes shall be controlled as may be necessary to ensure that to the maximum practicable extent the underground waters of the state are maintained at their natural quality unless a determination is made by the agency that a change is justifiable by reason of necessary economic or social development and will not preclude appropriate beneficial present and future uses of the waters."

8. Minn. R. 7045.0528

This ARAR applies to the design and construction of the DNAPL pumpout system, which was constructed after the ROD was written.

Soil/Operable Unit 4

1. **The Resource Conservation and Recovery Act (RCRA), 40 CFR Part 264**

RCRA is cited in the ROD in a section entitled, "Attainment of ARARs;" however, the ROD stated that RCRA did not define the level of decontamination of soil required and stated that EPA guidance requires that any contaminants left in subsoils not impact environmental media. The ROD stated that RCRA requires removal of all waste residues and soil contaminated with hazardous waste. The ROD acknowledged that most of the heavily contaminated soil had been already shipped off to an appropriate landfill. RCRA establishes requirements for RCRA-approved landfills.

This ARAR applies to product removed from DNAPL wells that is shipped to an offsite hazardous waste facility.

2. **ROD Soil Treatment Goals**

For contaminated soil left on-site, the ROD established a "treatment goal" of less than 100 mg/kg or ppm for total cPAHs and less than 150 ppm for PCP. The ROD did not cite a treatment goal for nPAHs. These treatment goals should be thought of as TBCs.

Surface Water

Minn. R. ch. 7050

This ARAR is not in the ROD. It classifies surface and ground waters of the state; establishes water quality standards for the classified waters such as Aquatic Life Standards (ALSs); establishes permit requirements for discharge; establishes treatment requirements; and provides for toxins standard development.

The ROD sets aquatic life criteria (ALC) for surface water. In 1990, the use of ALCs by the MPCA staff was discontinued and compound specific numbers were promulgated. In April 1994, ALSs were promulgated for evaluation of surface water for human and environmental risks. The ALSs for Class 2 Waters (revised February 2000) are considered to be protective of biota in Shingle Creek (use Class 2B/2C/2D Chronic Standards). The ALSs for the COCs at the Site are listed in Table 2.

TBC's and ARAR's Not Cited in the ROD

Expanded List Carcinogenic PAHs

As directed in an October 29, 2002 internal MPCA memorandum, the list of PAHs to be analyzed for at Superfund and Superfund VIC sites was expanded to 25 cPAHs. The MDH laboratory analyzed soil samples collected from the West Area for PAHs by MDH Method 515, "PAH (Expanded List) in Soil/Sediment by Full Scan GC/MS." The expanded list PAHs detected included dibenzo[a,h]pyrene, dibenzo[a,l]pyrene and 5-methylchrysene. In an April 14, 2004 letter, the MPCA staff requested that Joslyn determine the extent and magnitude of the expanded list cPAHs in the West Area. The benzo(a)pyrene equivalency factor associated with the expanded list of cPAHs are TBCs for the Site.

Other Considerations

1. **MPCA Risk-Based Site Evaluation Guidelines**

In 1998, the MPCA developed and distributed to the regulated community a set of guidelines for the Minnesota Superfund program. These guidelines are intended to cover the common administrative and technical issues for state Superfund sites.

2. **Determining Land Use**

On October 8, 1996, the MPCA staff approved cleaning up the land (soil) of the Site for general industrial use scenario based on a Joslyn report that used this guidance document. Establishing the land use scenario assisted the MPCA staff in establishing revised cleanup criteria for the Site. This determination was done pursuant to **OSWER Directive 9355.7-04, "Land Use in the CERCLA Remedy Selection Process," dated May 25, 1995**

3. Fencing and Warning Signs around the West Area

Section 300.415 of 40 CFR Part 300 (the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)) and Minnesota Statutes, Section 115B.02, Subd.17 (5) (MERLA) characterize the fencing and warning signs installed around the West Area by state and Federal Superfund.

Since the last five-year review, the MPCA staff requested that Joslyn install fencing around the West Area to restrict human access to the contaminated soils, sediment, and surface water in the West Area and Joslyn installed the fencing. Also the MPCA staff installed warning signs on the fencing to warn people to stay out of the West Area. The installation of the fencing and the warning signs are removal actions under CERCLA and MERLA. Section 300.415(e)(1) of the NCP states that "[f]ences, warning signs, or site control precautions – where humans...have access to the release..." are removal actions. Minn. Stat. Section 115B.01. Subd. 17 (5) of MERLA states that "[r]emove or removal includes, but is not limited to, security fencing or other measures to limit access..." These removal actions, which have been identified in this review as an interim security precautions, were implemented to limit human access to the West Area while remedial actions for the West Area are evaluated, selected and implemented.

REMEDY IMPLEMENTATION

The ROD documented the selection of the RAs for the Site. The RAs included on-site biological treatment of contaminated soil (or the off-site disposal of heavily contaminated soil – soil unable to be treated biologically); operation and maintenance of the ground water pumpout system; operation and maintenance of a DNAPL pumpout system; and regional ground water and surface water monitoring.

Operable Units 1 and 2

Ground water extraction was initiated in February 1989 from the shallow (OU1) and the middle (OU2) sand units and continues to the present. The number and location of the pumpout wells has changed over the years based on the status of the remedial actions and the property redevelopment. In 2003, the ground water extraction system consisted of nine wells (U1, U1A, U2A, U4N, U5, U6N, U7N, U11 and U12) screened in the shallow sand unit and two wells (W253 and W255) screened in the middle sand unit. The ground water is pumped to an oil water separator and subsequently discharged via the sanitary sewer to the Metropolitan Wastewater Treatment Facility under an MCES permit, for treatment. The Metropolitan Wastewater Treatment Facility is a publicly owned treatment works (POTW). The ground water discharge is monitored based on the requirements of discharge permit number 2013 issued by MCES on November 3, 2003.

Operable Unit 3

The DNAPL recovery system began operation in December 1995 and continues through the present. The DNAPL recovery system consists of recovery well W251, a DNAPL recovery enhancement well U8, and a 2,000 gallon double walled storage tank which is located in a buried concrete vault. The DNAPL accumulates in the tank until there is a sufficient quantity to transport the product to an off-site disposal facility.

Operable Unit 4

Operable Unit 4 consists of the contaminated soil remaining on-site following completion of the Interim Response Action in 1988. A land treatment unit (LTU) was constructed on-site in 1989 for the biological treatment of contaminated soil. Biological treatment of approximately 90,000 cubic yards of soil was completed in five treatment lifts from 1989 through 1997 (Table 3). There was additional assessment and remedial actions performed at OU4 since the last five-year review. These actions are discussed in a later section of this report.

Regional Ground Water and Surface Water Monitoring

Ongoing ground water monitoring is performed at both on-site and off-site wells based on a schedule updated at least annually by Joslyn and approved by the MPCA staff. Surface water monitoring is also performed at select off-site locations.

SYSTEM OPERATION AND MAINTENANCE

Joslyn is performing ongoing operation, maintenance and monitoring for the ground water extraction system and the DNAPL recovery system. The primary activities include the following:

- monthly site visits to perform routine system inspections and to check on the status of the fence at the West Area;
- quarterly sampling and analysis of the combined discharge from the OU1 and OU2 pumpout wells to the sanitary sewer per the requirements of the MCES discharge permit;
- quarterly cleaning of select discharge lines;
- quarterly water level measurements at select monitoring wells;
- quarterly sampling and analysis of the discharge at the Highway 100 Northeast Drain, assuming water is flowing;
- annual sampling and analysis of the discharge at the storm sewer outlet and from Shingle Creek upstream of the storm sewer outlet;
- annual sampling and analysis of ground water samples collected from select monitoring wells and from the pumpout wells;
- routine maintenance as required by site specific conditions; and
- submittal of an annual ground water monitoring report to the MPCA staff.

Routine maintenance at the ground water and DNAPL extraction systems consists primarily of cleaning the pumps and the discharge piping and replacement of worn-out equipment. The OU1 and OU2 pumping systems are periodically shut down to allow the city of Brooklyn Center to perform routine maintenance at the sanitary sewer lift station. There has not been any long-term discontinuation in the ground water and DNAPL extraction systems caused by maintenance issues, which have adversely affected the remedial action. The system operation, maintenance and monitoring data are presented in the AMR, which is submitted to the MPCA staff for review and comments.

The operation and maintenance costs were requested from Mr. Dale Finnesgaard, Senior Project Manager with Barr Engineering. Mr. Finnesgard indicated they were not available.

V. PROGRESS SINCE THE LAST REVIEW

The last five-year review, completed in 1999, contained several recommendations that are summarized below. The status of implementation of the recommendations presented in the 1999 review are described at the end of each section.

Ground Water/Operable Units 1, 2, and 3

The recommendations for these operable units, as presented in the 1999 review, are as follows:

1. Joslyn should continue to operate the ground water pump and treat and DNAPL recovery systems until the cleanup requirements are met.

2. Joslyn should continue to monitor on-site and off-site monitoring wells to verify that off-site ground water conditions meet HRLs.

3. Joslyn should continue to use the cPAH relative potency factor scheme to evaluate human health risk of media and the protectiveness of the remedies at the Site. Joslyn should continue to use these numbers to evaluate the existing ground water remedy in all future AMRs. Joslyn should continue to use the additivity calculation as described in the HRL Rule to evaluate ground water risks to human health. Joslyn should continue to list in a table any wells that exceed a hazard index of greater than or equal to 1.0. Joslyn should continue to evaluate the design pumpout rate based on the cPAH relative potency factor scheme and additivity, described above.

4. Joslyn should develop deed restrictions that prohibit the installation of drinking water supply wells within the Joslyn Site property until the ground water returns to potability.

5. Joslyn should continue reporting on the performance of all ground water remedies.

Joslyn has addressed and continues to address recommendation 1, 2, 3 and 5 in the AMR. Joslyn addressed recommendation 4 by executing an institutional control, consisting of a Declaration of Restrictions and Covenants, during May 2000 for Lots 1, 2 and 3.

Soil/Operable Unit 4

The recommendations for OU4, as presented in the 1999 review, are as follows:

1. Joslyn should continue to restrict access to the entire Site to prevent unauthorized entry. The Site fence should be inspected regularly and repaired if needed. Warning signs should be maintained.

2. The existing Site fence should either be modified to enclose the West Area or a new fence should be installed on the perimeter of the West Area to restrict access to the West Area until such time as the magnitude and extent of the contamination in this area is determined and appropriate remedies implemented.

3. Joslyn should obtain and keep in their files certifications that the DNAPL tank was properly designed and installed pursuant to Minn. R. 7045.0528, subp. 3g.

4. Based on the LRA [Limited Risk Assessment completed by the MPCA staff], dioxins and furans should continue to be included as COCs for the Site.

5. Joslyn should complete a wetland delineation map of the West Area to determine the extent and types of wetlands present in the West Area.

6. Joslyn should map the 100-year flood plain in the West Area.

7. Joslyn should determine the magnitude and extent of contaminated soil containing Site COCs (including dioxins and furans) in the West Area and implement necessary remedies.

Most of OU4, with the exception of the West Area, has been redeveloped as part of three MPCA Superfund VIC development phases. As part of Phase I development the 90,000 cubic yards of contaminated soil contained in the LTU was excavated, reconfigured and compacted beneath either the building or parking lots. Under subsequent phases of development, OU4 was either capped by a building, a parking lot, or by three feet of clean soil. Three buildings for light industrial use, associated parking lots, stormwater ponds and an extension of Azelia Avenue have been constructed. The redevelopment of the Site was coordinated through the MPCA VIC program.

Recommendation 1 has been addressed by capping accomplished during the three Superfund VIC phases of development and the construction of Azelia Avenue. There is no longer a requirement to restrict access to the entire Site or to maintain a fence around

the former LTU area since the contaminated soils have been capped beneath the footprint of buildings, under parking lots and/or by a three-foot soil cover. The cover consists of either concrete used for slab on grade building construction, asphalt with subgrade material for parking lots or a three-foot clean soil cover.

Recommendation 2 was addressed by installing a new chain link fence with a locked gate around the north, east, west and south sides of the West Area. A portion of the northwestern perimeter was not fenced because of the presence of the wetland, which did not present solid footing conditions for installation of the fence. Warning signs were posted on the fence by the MPCA staff and signs were posted on fence posts in the wetland on the western perimeter of the West Area where it was not feasible to construct a fence. The signs warn of the presence of contaminated soil, surface water, and sediment; and include a list of MPCA staff telephone numbers to call for information. No trespassing signs were posted on the fence by Joslyn.

Barr Engineering stated that a copy of the tank documentation is maintained in the control building at the Site and in the project file at Barr Engineering as requested by recommendation 3.

Recommendations 4 through 6 were addressed in the 1999 report, "Wetland Delineation and Identification of Data Gaps."

Recommendation 7 requested further characterization and remediation of the remaining contamination at the West Area. Additional characterization was performed and was documented in the May 2001 - revised October 2001 - report, "Supplemental West Area Characterization Report." Further investigation was documented in the October 2003 Remedial Investigation Report, which is currently under review by the MPCA staff.

Surface Water

The recommendations relative to surface water presented in the 1999 review are as follows:

1. Joslyn should sample the well(s) near the drain tile to determine if contaminated ground water is entering the drain tile area. If there is a pattern of benzo-a-pyrene detected in the well(s) near the drain tile (four consecutive detections), Joslyn should propose a remedial action for this area.

2. Joslyn should continue to sample the Highway 100 drain tile/storm sewer system for PAHs and PCP when the water table is elevated and water is flowing in the drain tile system. If contaminants from the Site are found in the system above surface water ARARs or TBCs, Joslyn should sample water from the creek and outfall. If continual exceedances occur, Joslyn should evaluate and propose remedial actions to address this problem.

3. Joslyn should evaluate all surface water data relative to the ALSs and modify any future annual reports accordingly as appropriate based on this evaluation. It is appropriate to evaluate upgradient PAH levels when evaluating the discharge from the Highway 100 drain tile into Shingle Creek. Joslyn should use analytical methods that can detect exceedances of all ALSs identified above.

Joslyn has addressed and continues to address Recommendations 1 through 3, as documented in the site annual reports. Joslyn continues to perform the ground water and surface water monitoring and continues to present and evaluate the data in the AMR. Joslyn continues to evaluate options for laboratory analytical methods that can provide detection levels below the ALS criteria. Well S-1 will replace the wells previously used in addressing Recommendation 1.

The Minnesota Department of Transportation (MnDOT) is performing a reconstruction of Highway 100 and access from the adjacent residential streets. The Highway 100 reconstruction also required reconstruction of the adjacent railroad overpass. It was necessary to perform dewatering in 2002 and 2003 during the installation of footings for the railroad bridge and other aspects of the road reconstruction. There was a concern that dewatering would result in the migration of the contaminant plume from the Site towards the drain tile/storm water system located beneath Highway 100. Therefore, a new monitoring well, located upgradient of the drain tile/storm water system was installed by MnDOT as a sentinel well to monitor the dewatering. The well, S-1, will be turned over to Joslyn to use for monitoring ground water upgradient of the drain.

Air

The recommendations relative to air presented in the 1999 review are as follows:

1. Until the cap is placed on the LTU and the portion of the East Area identified in the LTA as having unacceptable risks, Joslyn should continue to implement measures to control fugitive dusts and monitor air at the Site's border using the appropriate sampling and analytical methods.

Air monitoring and dust control measures are no longer performed because the LTU soils and other contaminated Site soils were effectively capped during Site development. The West Area is covered by native vegetation. The development includes the construction of three buildings and associated parking and drive areas and the construction of the Azelia Avenue extension. A 3-foot thick soil cover was installed and is maintained in areas not covered by the structures or by concrete or asphalt. Recommendation 1 was addressed and is no longer applicable as site development has been completed.

Risk-Based Site Evaluation Guidelines

The recommendation listed below was included in the 1999 review as follows:

1. In the future, Joslyn should evaluate Site ARARs and TBCs for consistency with the Risk-Based Site Evaluation Guidelines and inform the MPCA staff of any inconsistencies.

Joslyn continues to review and evaluate the ARARs and TBCs in the AMR.

VI. FIVE-YEAR REVIEW PROCESS

Administrative Components

The Five-Year Review was initiated on January 9, 2004. The Joslyn representative was notified of the initiation of the five-year review during January 2004. The review components included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

Community Involvement

On February 25, 2004, the MPCA staff sent an e-mail message to a local advisory group announcing that a five-year review was being conducted for the Site.

On March 4, 2004, a notice was published in the Brooklyn Center Sun Post newspaper announcing that a five-year review was being conducted for the Site.

Document Review

This five-year review consisted of a review of relevant documents including the AMRs, MPCA staff response letters and the previous five-year review reports. A list of the documents reviewed is presented in the Bibliography (Appendix C).

Data Review

The available data and the status of the RA for each of the operable units are discussed as follows:

Operable Unit 1 and 2

The ground water monitoring network includes wells at both on-site (Figure 5) and off-site (Figure 6) locations. The horizontal ground water flow direction is generally to the east in the upper sands (Figure 7) and the lower aquifer (Figure 8).

Ground water extraction has occurred since February 1989 from the shallow (OU1) and the middle (OU2) sand units. The ground water extraction system has been modified over the years in response to Site development and the shrinking of the contaminant plume. In 2003, the ground water extraction system consisted of nine wells (U1, U1A, U2A, U4N, U5, U6N, U7N, U11 and U12) screened in the shallow sand unit and two wells (W253 and W255) screened in the middle sand unit. Pumpout wells W253 and W255 are alternated on a monthly basis. Pumpout well U1 was used temporarily in response to the dewatering along Highway 100. Pumping at well U8 was discontinued during 2002 due to a consistently low pumping rate. Over 89,000,000 gallons of water was pumped from the nine pumpout wells during 2003. This represents a significant increase in the volume of ground water pumped at the Site and will be discussed later in this report.

The ground water from the nine pumpout wells is pumped into an oil water separator prior to discharge to the sanitary sewer. Monthly discharge samples have routinely been collected for analysis. The discharge permit was reissued by MCES on November 3, 2003 and the sampling frequency was reduced to quarterly. Laboratory analysis has detected PCP and several SVOCs in the effluent. The discharge has historically met the discharge criteria as established by MCES in the permit. The current permit required the analysis of the discharge sample collected during the first calendar quarter of 2004 for 2,3,7,8-TCDD. Laboratory analysis did not detect 2,3,7,8-TCDD in the discharge sample collected on March 9, 2004.

During the first nine years of operation the PCP concentration in the discharge from the oil water separator varied greatly and averaged more than 1,000 ug/l. Since 1997, the PCP concentration has been more stable. In 2003, the PCP concentration averaged 580 ug/l (Table 4).

Approximately 429 pounds of PCP were removed with the ground water in 2003. Since initiation of the groundwater remedy in 1989, approximately 8,219 pounds of PCP have been removed. The PCP mass removed in 2003 was similar to that removed in recent years.

Approximately 126 pounds of detectable PAHs were removed with the ground water in 2003 and approximately 2,813 pounds of detectable PAHs have been removed since start-up of the pumping system. No measurable cPAHs were removed with the ground water in 2003. Approximately 33 pounds of cPAHs have been removed since start-up of the pumping system. The PAH mass removed in 2003 was similar to that removed in recent years.

The ground water quality data for the OU1 and OU2 wells indicates the PCP and PAH concentrations as well as the size of the contaminant plume continue to decrease since start-up of the pumping system. Figure 9 shows the dramatic decrease in the PCP plume which has occurred since 1988. The highest documented PCP concentrations are located along the south-central portion of the Site, which is generally in the vicinity and downgradient of the former processing area and the DNAPL pool (OU3) as indicated on Figures 10 and 11. The ground water samples collected from the off-site and lower aquifer wells in 2003 had a hazard index below 1 (Figure 12).

During the 1999-2004, there have been several phases of road reconstruction near the Site. Typically, utilities are replaced at the same time. Some utility and some road subgrade construction required lowering the water table by dewatering to complete the work. Joslyn has worked in close coordination with other parties to minimize the effect of the Site on the construction projects, and to minimize the effect of the construction projects on the Site remediation activities. In most instances, slight modifications in the construction work and/or adjustments in the Joslyn systems have proved adequate. In 2003, utility work near the Site required operation of temporary supplemental pumpout wells in order to maintain capture of the Joslyn plume on the Site. MnDOT installed 20 wells, referred to as "soldier" wells, in the east-central part of the Site and operated and monitored the wells for about three weeks.

Prior to the start of dewatering and throughout 2003, the pumping rates at the Joslyn pumpout wells were increased to minimize the influence of the dewatering on plume migration. The normal design pumping rate for the OU1-OU2 system had been about 160 gallons per minute (gpm). During the second half of 2003, the pumpout system discharge rate was approximately 200 gpm. Joslyn anticipates operating the OU1 pumpout system at a higher rate through the summer of 2004 to aid in recovering contaminants that may have migrated towards the perimeter of the Site as well as to mitigate the effects of construction dewatering in 2004, if any.

Joslyn stated in the 2003 AMR that the construction dewatering did not appear to have had a significant affect on overall ground water quality, based on ground water monitoring performed in 2003. The data in the 2003 AMR does indicate that the PCP and the hazard index increased by an order of magnitude at W6N in 2003 as compared to the historical concentrations. Well W6N is located along the south-central property boundary. The 2003 AMR states the increase in concentrations is likely due to the influence from the dewatering. PCP was not detected in samples collected in December 2003 from wells W127N and W132, which are located side- and downgradient of W6N. The 2003 AMR states that the existing OU1 pumping system should be able to capture the contaminants detected at W6N based on past performance.

The 2003 AMR includes a further evaluation of the capture zones using a MODFLOW model. The additional ground water modeling was performed to evaluate the impacts of

the dewatering on the contaminant plume and to evaluate future design rates for the pumpout system. The MPCA staff is still reviewing the 2003 AMR.

At the request of the MPCA staff, Joslyn prepared a Quality Assurance Project Plan (QAPP) in 2000 for ground water and surface water sampling, analysis and related tasks. The QAPP was approved by the MPCA staff with comments on February 23, 2001. The subsequent monitoring tasks have been performed pursuant to the current QAPP.

There have been numerous changes to the monitoring well and pumpout well network since the last five-year review. The on-site and off-site changes include the abandonment of numerous wells and the installation of replacement wells as needed. Some of the changes were the result of ongoing efforts to maximize the effectiveness of the ground water extraction system and monitoring network as the size of the plume has decreased; however, many of the changes were necessitated by the on-site development of the property and the off-site changes to the railroad overpass, the reconfiguration of the surrounding roads, and the Highway 100 reconstruction. The changes to the on-site and the off-site ground water extraction and monitoring network have not adversely impacted the effectiveness of the ground water remedy. The changes to the ground water extraction and monitoring network are listed below.

Table B: Changes to Monitoring and Ground Water Extraction Network (1999 – 2003)

	Well Abandoned	Well Installed
1999	U6, U7, W2, W6, W131, W252, W206, W207 and W307	U6N, U7N, W2N, W6N, W252N
2000	U3, P3, P4, P5, W7, W9 and W209	U11 and U12
2001	P1, P2, P3, P6 and U2	None
2002	U4, W300SP, W121 and W122	W300SPN and U4N
2003	W112, W123, W127, W223 and W323	W132, W127N and S-1

Operable Unit 3

The DNAPL recovery system began operation in December 1995. The DNAPL recovery system consists of recovery well W251, a DNAPL recovery enhancement well U8, and a 2,000 gallon double walled storage tank which is located in a buried concrete vault.

The vault and its enclosed equipment were moved in 1999 to facilitate development of Lot 1. DNAPL recovery was restarted in February 2000 and continues through the present.

In 2003, approximately 1,500 gallons of DNAPL were removed from the aquifer by the OU3 remediation system. Approximately 10,800 gallons of DNAPL have been removed from the subsurface since the DNAPL recovery system start-up in 1995 (Table 5). On July 23, 2003, approximately 1,600 gallons of DNAPL were removed from the storage tank and transported to the Safety Kleen facility (EPA ID No. TXD055141378) in Deer Park, Texas for disposal.

Joslyn continues to manage the DNAPL recovery system to minimize the introduction of ground water into the lowest portion of the DNAPL pool because this could adversely affect the effectiveness of the DNAPL removal. This is managed through DNAPL level monitoring and adjusting the DNAPL pumping rate at the recovery well(s). The elevation of the DNAPL pool dropped significantly during the latter part of 2003. Pumping was discontinued at W251 for about one month during November 2003 to allow the DNAPL level to recover and to minimize intrusion of water into the DNAPL pool. The DNAPL level recovered and pumping was resumed.

Well U8 is used on an as-needed basis for DNAPL recovery or to enhance recovery at W251. Pumping at U8 has not occurred in several years; however, the need to utilize U8 is evaluated on an ongoing basis.

Operable Unit 4

The activities and actions associated with OU4 since the last review are described below. These include a combination of activities and actions performed by Joslyn and by the developer, Real Estate Recycling LLC (RER). They are as follows:

January 1999 Release sampling was performed within the upper three feet of soil by RER to characterize current soil conditions prior to initiation of the property development. The objective of the release sampling was to determine the residual contaminant concentrations in "currently accessible soils" on-site (soils within 3 feet of the ground surface). For risk assessment purposes, the MPCA staff had determined that only soils within 3 feet of the ground surface would pose a risk for site development.

March 1999 A Human Health Limited Risk Assessment was completed by MPCA staff for the Site based on the data obtained from the release sampling.

May 1999 West Area 3 Excavation: contaminated soil was encountered within three feet of the surface during the release sampling along and beneath the western edge of the LTU dike. Joslyn excavated 1,000 cubic yards of soil from the upper three feet which was transported to Lone Mountain, a RCRA Subtitle C disposal facility.

June 1999 Western LTU Soil Excavation: contaminated soil remained along the western edge of the LTU dike below a depth of 3 feet upon completion of the West Area 3 excavation. MPCA staff requested, as a condition of delisting, the "removal of visually contaminated soil in the extension of the West Area Three that is inside the fence where Joslyn cut into the toe of the LTU berm to remove such soil." Joslyn removed 50 cubic yards of additional contaminated soil from beneath the western LTU. The soil was blended with soil from within the LTU until the concentrations met the

criteria. The blended soil was placed in the LTU within the footprint of the proposed building at Lot 1.

6/1999–1/2000

Performed Lot 1 Site preparation including excavation and re-compaction of soils within the footprint of the building and beneath the adjacent parking and drive areas, design and construction of a vapor barrier and vapor venting system beneath the building floor, design and construction of modifications to the existing ground water extraction and treatment system, and design and construction of a stormwater collection, conveyance and retention system.

May 2000 Finalized the declaration of restrictions and covenants for the 12.5853 acre parcel legally described as Lot 1, Block 1, Joslyn Addition, Hennepin County, Minnesota; the 3.4308 acre parcel legally described as Lot 2, Block 1, Joslyn Addition, Hennepin County, Minnesota; and the 8.1579 acre parcel legally described as Lot 3, Block 1, Joslyn Addition, Hennepin County, Minnesota.

May 19, 2000 MPCA Superfund VIC program issued a Certificate of Cleanup for the Lot 1, Block 1, Joslyn Addition.

5/2000–11/2000

Implementation of response actions associated with the development and construction of Building II. The response actions included the excavation and re-compaction of soils (including the top three-feet of soils from Grid I-1) within the Building II footprint and under the adjacent parking and drive areas; the design and construction of modifications to the existing ground water pump-out and treatment system; and the design and construction of a stormwater collection, conveyance and retention system.

June 1, 2000 Partial deletion of OU4 of the Site from the MERLA PLP was completed. The partial delisting is for all Site land, except for the West Area.

10/2000-11/2000

Additional sampling was performed at the West Area to characterize the residual contamination in the surficial soil, surface water and sediment to determine whether additional action is warranted to protect human health and the environment (Supplemental West Area Characterization Report). The COC's were PCP, PAH's and dioxin/furan's. A review of the data indicates the COC's, including dioxin/furans, were detected in the soil, sediment and surface water samples.

10/2000-11/2000

Completed response actions associated with the Azelia Avenue extension (VP9731 –Azelia Avenue Extension). The response actions included excavating and relocating debris encountered in the vicinity of U-4 and monitoring well W-300SP; excavating and relocating topsoil from along the roadway; importing and placing engineered fill in the roadway; and replaced and realigned buried utilities. This included the installation of new storm sewers and the replacement of buried piping and electrical for the adjacent pumping wells.

2000 – 2001 Joslyn installed the fence around the West Area, with the exception of one area along the northwestern boundary where open water in the wetland provides a natural barrier (Figure 13). Signs are posted in this area. Warning signs were also placed on the fence. There is a locked access gate located along the northeast corner of the fence.

July 2001 Permanent cover was established over all portions of the Site, except for the West Area and a narrow strip along the east end where a temporary cover (6 inches of clean soil) was provided in anticipation of construction of a paved truck dock for Building III. The permanent cover consists of the lined water retention ponds, Buildings I and II, the asphalt or concrete drive and parking areas, and the soil cover.

December 2001

From November 21 to December 7, 2001, work was performed to install an eight-inch thick layer of crushed rock (MnDOT Class 5 gravel) over the temporary cover and over areas with revisions to the final grade. Some areas required cut and fill to prepare the sub-grades for construction. Once the final sub-grades had been achieved, the underlying clean soils were covered with the eight-inch thick layer of imported crushed rock. Completion of this phase of work results in the placement of permanent cover over all portions of the Site consistent with the Developers Response Action Plan (Figure 14). Those areas not covered by buildings, asphalt or concrete were covered by a minimum of three feet of clean soil.

February 2002

A buried water line, which serves as a fire water supply line failed on February 5, 2002. Some released water and some previously impacted soil from around the water line were forced to the surface and entered the stormwater conveyance and retention system. The response actions included the excavation, placement and recompaction of restricted use soils beneath the permanent cover; the replacement of the water main; the inspection, sampling and analysis of released soils and removal of these soils from the stormwater retention pond; and placement of the soils beneath approved cover on-site.

April 9, 2002 MPCA issues Certificate of Cleanup for the Building II Site.

August 16, 2002
Partial deletion of OU4 of the Site from the NPL was completed.

October 10, 2003
Submittal of the West Area Remedial Investigation Report which documents additional assessment performed at the West Area. The report includes determination of the magnitude and extent of Site COCs in soil, sediment, and surface water of the West Area.

Surface Water

The Highway 100 subgrade has a series of drain tiles that protect the highway from flooding during periods of high ground water. The drain tile system is downgradient of the Site, so it could potentially intercept contaminated ground water. Therefore, water sampling and analysis at the Highway 100 Northeast Drain (NE Drain) and at points downstream are part of the monitoring system.

Water samples are collected quarterly from the NE Drain, if water is flowing, and annually from the storm sewer outlet and from Shingle Creek upstream of the outfall (Figure 4). During 2003, only two quarterly samples (March and June) were collected from the NE Drain because of low flow associated with below normal precipitation and the effects of dewatering. Water samples were collected during June and December 2003 from the storm sewer outlet and from Shingle Creek.

PCP was not detected in the water samples collected during 2003 from the NE Drain, the storm sewer outlet, and from Shingle Creek. Benzo(a)pyrene was not detected in the two samples collected from the NE Drain in 2003 (Table 6). Benzo(a)pyrene has been detected in 3 of 14 samples collected from the NE Drain since 1999. Since 1999, laboratory analysis has detected benzo(a)pyrene in 2 of 6 samples collected from the storm sewer outlet and in 4 of 7 samples collected from Shingle Creek, upstream of the sewer outfall.

An evaluation of the data must take into consideration that the laboratory detection limits for benzo(a)pyrene from commercially available laboratories continues to be greater than the surface water quality criteria. However, the benzo(a)pyrene occurrence and concentration at the NE Drain has been decreasing since monitoring began in 1987. The benzo(a)pyrene concentrations detected at the storm sewer outlet and in upstream Shingle Creek have historically been higher than the concentration detected at the NE Drain.

MnDOT installed a sentinel monitoring well, S-1, between the eastern Joslyn property line and the NE Drain (Figure 6). One purpose of the sentinel well was to provide an

indication of the ground water quality prior to discharge to the Highway 100 underdrain system. Fourteen water samples were collected by MnDOT from S-1 for analysis between July and December 2003. Laboratory analysis detected PAHs in some of the samples, although benzo(a)pyrene and PCP were not detected in the fourteen samples (Table 7).

Joslyn had expressed a concern that the water quality at the NE Drain may not be indicative of ground water quality originating from the Site due to PAH impacts from stormwater runoff from the highway. The MPCA staff has informed Joslyn that no violation would be considered to have occurred as long as there are no more than four consecutive detections of benzo(a)pyrene at a well near the drain or a clear indication of benzo(a)pyrene from the Site migrating to the drain. Benzo(a)pyrene was not detected at S-1 in the fourteen samples collected for analysis in 2003.

Off-site Issues

2002-2003 Ongoing development activities which either directly or indirectly had the potential to affect the Site remedial actions. The development activities included connecting 50th Street to Azelia Avenue on the north side of the Site (VP9731 – France Avenue Realignment); the re-construction of the CP Rail railroad bridge overpass at the intersection with France Avenue (VP15970 – CPR TH100 Project) and Highway 100 (VP17500 MNDOT TH100 Project - 4 Addendums); and the closing of France Avenue east of the Site. Several monitoring wells were abandoned as a result of these activities. Dewatering was performed during construction of the new pier and abutment foundations as previously described.

Site Visit

Site visits have been conducted by the MPCA staff periodically throughout the review period; however, a site visit was conducted on February 2, 2004 as part of the Five-Year Review process. There was approximately 15 inches of snow on the ground and it was snowing heavily during the site visit. Many of the monitoring wells and recovery wells referenced in this document were observed, although, it wasn't possible to locate all of the wells because of the snow cover. Contaminated groundwater was observed being pumped into the oil water separator tank and into POTW collection system. The ground water recovery system wells for the plume containment system were all observed to be in operation. It was not possible to document the integrity of the Site cover because of the snow cover; however, the cover components were observed and approved as part of the various approvals of the Superfund VIC Response Action Plans by the MPCA staff for each of the phases of development of the site. Institutional controls are in place for the developed portion of the Site that require that any modifications to the cover be first approved by the MPCA staff.

Interviews

Interviews were conducted with various parties connected to the Site.

Mr. Maclay Hyde, the owner of RER, was interviewed on March 22, 2004. RER is the party responsible for development of the Site and adjacent property. Mr. Hyde did not express any concerns or issues associated with the remedy. He said the redevelopment of the contaminated property was a success story from his perspective.

An interview was conducted on March 22, 2004 with Mr. Tim Rothstein, engineer with MCES, regarding the discharge to the POTW. Mr. Rothstein indicated the discharge from the Site is meeting the requirements of the permit. He said the discharge permit (no. 2013) was renewed during November 2003 and the current permit expires on October 31, 2006. The sampling frequency was reduced from monthly to quarterly in the current permit. MCES also required that the discharge sample collected during the first quarter of 2004 be analyzed for dioxin/furans.

Mr. Brad Hoffman, Community Development Director with the City of Brooklyn Center, was interviewed on March 23, 2004. Mr. Hoffman said the city was pleased with the status of the project, especially the redevelopment of the property.

Mr. Dale Finnesgaard, Project Manager with Barr Engineering was interviewed on March 23, 2004. Mr. Finnesgaard was interviewed because of his dual role as the consultant and as the local Joslyn representative. He stated the soil and ground water remedial actions have been very successful and protective of human health and the environment.

VII. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

The soil and ground water remedies are functioning as intended. The contaminant plume has been decreasing in size and appears to be within the Site boundaries. The ground water extraction system continues to remove COCs from the upper and middle sand units and the DNAPL recovery system is removing DNAPL. Contaminated soil was treated to the specified cleanup levels in the LTU, which provided biological treatment of the soil, and the soil was effectively capped during the Superfund VIC development phases. The various forms of cover continue to limit exposure to impacted soil.

The additional characterization performed at the West Area detected Site COCs, including PCP, PAHs, dioxins and furans. A fence was installed around the West Area as an interim security precaution to minimize trespassing in the West Area until a remedy can be implemented. The remaining contamination in the West Area will need to be addressed with a remedy before the area can be deemed to be fully protective of human health and the environment in the short- and long-term.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Most of the ARARs and the TBCs established at the time of the remedy selection or in the two previous five-year reviews have not changed and are still valid. The ALSs for surface water were revised in February 2000 and the changes are discussed below.

As directed in an October 29, 2002 internal MPCA staff memorandum, the list of PAHs to be analyzed for at Superfund and Superfund VIC sites was expanded from 7 to 25 cPAHs. The MDH laboratory analyzed soil samples collected from the West Area for PAHs by MDH Method 515, "PAH (Expanded List) in Soil/Sediment by Full Scan GC/MS." The expanded list PAHs detected included dibenzo[a,h]pyrene, dibenzo[a,l]pyrene and 5-methylchrysene. In an April 14, 2004 letter the MPCA staff requested that Joslyn determine the extent and magnitude of the expanded list PAHs.

Laboratory analysis detected dioxins along the southern property line at the West Area. In an April 14, 2004 letter, the MPCA requested that Joslyn determine the extent and magnitude of dioxin contamination along the entire southern property boundary.

The MPCA staff intends to re-evaluate exposure assumptions, toxicity data, cleanup levels, and remedial action objectives and to consider a ROD amendment to memorialize any resulting changes to the ROD.

Are you aware of any significant changes to ARARs or TBCs since the last review?

The MPCA has added dioxin and the expanded PAH list as TBCs for the Site as described above. This includes potential impacts in the soil, sediment, ground water, and surface water at the West Area and surrounding areas.

The MCES has added a requirement to the discharge permit to analyze the discharge from the oil water separator to the sanitary sewer for dioxin (2,3,7,8-TCDD) in the first quarter of 2004. The permit sets a discharge criteria of <0.002 ug/l for 2,3,7,8-TCDD. Laboratory analysis did not detect 2,3,7,8-TCDD.

In February 2000, the MPCA revised the ALSs for surface water as listed in MN Rules Chapter 7050. This resulted in revisions to some of the chronic standards applicable to the surface water monitoring performed at the Site. The updated standards are presented on Table 2 and on Table 6.

Question C: Has any other information come to light that could question the protectiveness of the remedy?

There have been some physical changes to the ground water remedy at the Site since completion of the last five-year review to accommodate development of the Site. The

changes were fully evaluated prior to implementation to determine that the remedy was not compromised and do not appear to have affected the effectiveness of the remedy. There is no other information that calls into question the protectiveness of the ground water remedy.

The available data indicates there is soil, sediment and surface water contamination in the West Area that needs to be characterized and a remedy implemented to proceed towards complete delisting of OU4.

An investigation is underway to determine whether or not a release of Site COCs has occurred from the former Joslyn facility to Twin Lake and, if so, whether or not there are unacceptable risks to public health and the environment. This data was not available for inclusion as part of this five-year review.

VIII. ISSUES

Table C - Issues

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
The remaining soil contamination in the West Area needs to be characterized and a remedy implemented to proceed towards complete delisting of OU4 for the Site.	Y	Y
Determine if a release of COCs from the Joslyn facility has occurred in Twin Lake, and if so, determine whether or not there are unacceptable risks to public health and the environment.	Y	Y

IX. RECOMMENDATIONS

The ground water extraction remedy is removing VOCs from the shallow and middle sands and is providing containment of the contaminant plume. The DNAPL recovery system continues to remove DNAPL. The soil contamination issues associated with OU4 have been resolved, with the exception of the West Area. The following recommendations are:

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)	
				Current	Future
Complete the characterization of soil, sediment and surface water contamination in the West Area and implementation of a remedy that is protective of human health and the environment.	Joslyn	MPCA	2005	Y	Y
Determine if a release of Site COCs to Twin Lake has occurred, and if so, are there unacceptable risks to public health and the environment.	Joslyn	MPCA	2005	Y	Y

- continued operation and maintenance of the ground water extraction system and the DNAPL recovery system with an annual review of the status and effectiveness, with recommendations for changes as warranted;

- continued ground water and surface water monitoring with an annual review of the status and effectiveness, with recommendations for changes as warranted;

- replace, as needed, down gradient monitoring wells that were lost due to Highway 100 MnDOT reconstruction;

- update in the AMR the appropriate standards in the ARARs and TBCs as they are revised by the appropriate state or federal regulatory agency;

- update the Environmental Restrictive Covenants for the three facility parcels after all current development has been completed; and

- re-evaluation by the MPCA staff of exposure assumptions, toxicity data, cleanup levels, and remedial action objectives and consideration by the MPCA staff of a ROD amendment to memorialize any resulting changes to the ROD.

X. PROTECTIVENESS STATEMENT

The ground water and DNAPL remedies are functioning as intended and are protective of

human health and the environment. The ground water extraction remedy is removing COCs from the shallow and middle sands and is providing containment of the contaminant plume. The DNAPL recovery system continues to remove DNAPL.

The soil remedy for the developed portion of the Site has addressed the soil impacts and the Site cover continues to be protective of human health and the environment.

The West Area fence and warning signs were installed as an interim security precautions to limit human access and exposure to contaminated soil, sediment and surface water. It has not been determined how effective these measures are in preventing people from accessing the West Area. The fence does not prevent wildlife exposure to Site COCs. A remedy is needed for the West Area to ensure both short- and long-term protectiveness of human health and the environment.

An investigation is underway to determine whether or not a release has occurred from the former Joslyn facility to Twin Lake and, if so, whether or not there are unacceptable risks to public health and the environment. Thereafter, short- and long-term protectiveness of human health and the environment will be determined.

XI. NEXT REVIEW

Hazardous substances, pollutants, or contaminants will remain at the Site that will not allow for unlimited use or unrestricted exposure. EPA or the MPCA, if delegated to do so by EPA, will conduct another Five-Year Review five years from the date of this Review.

APPENDIX A

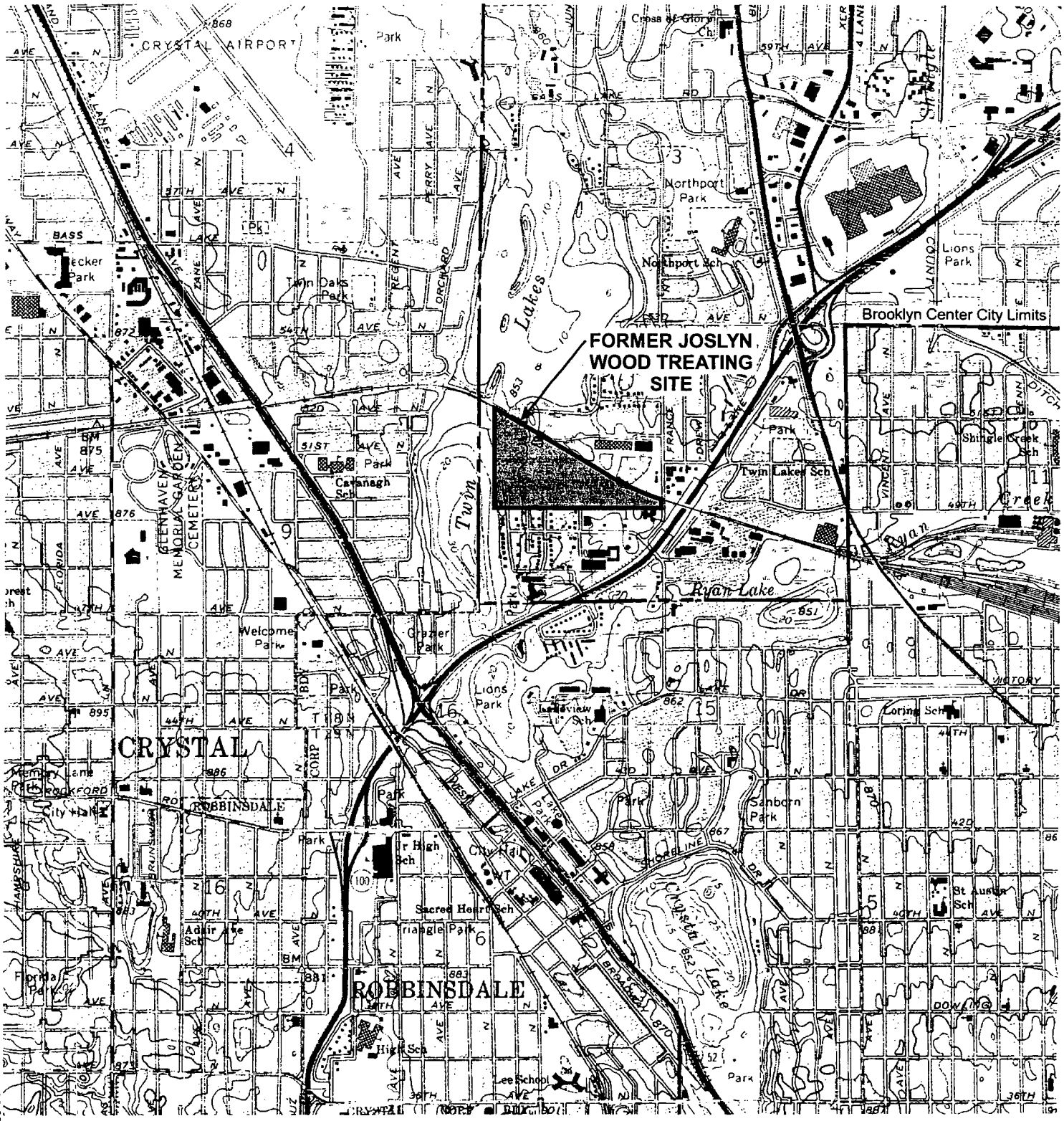
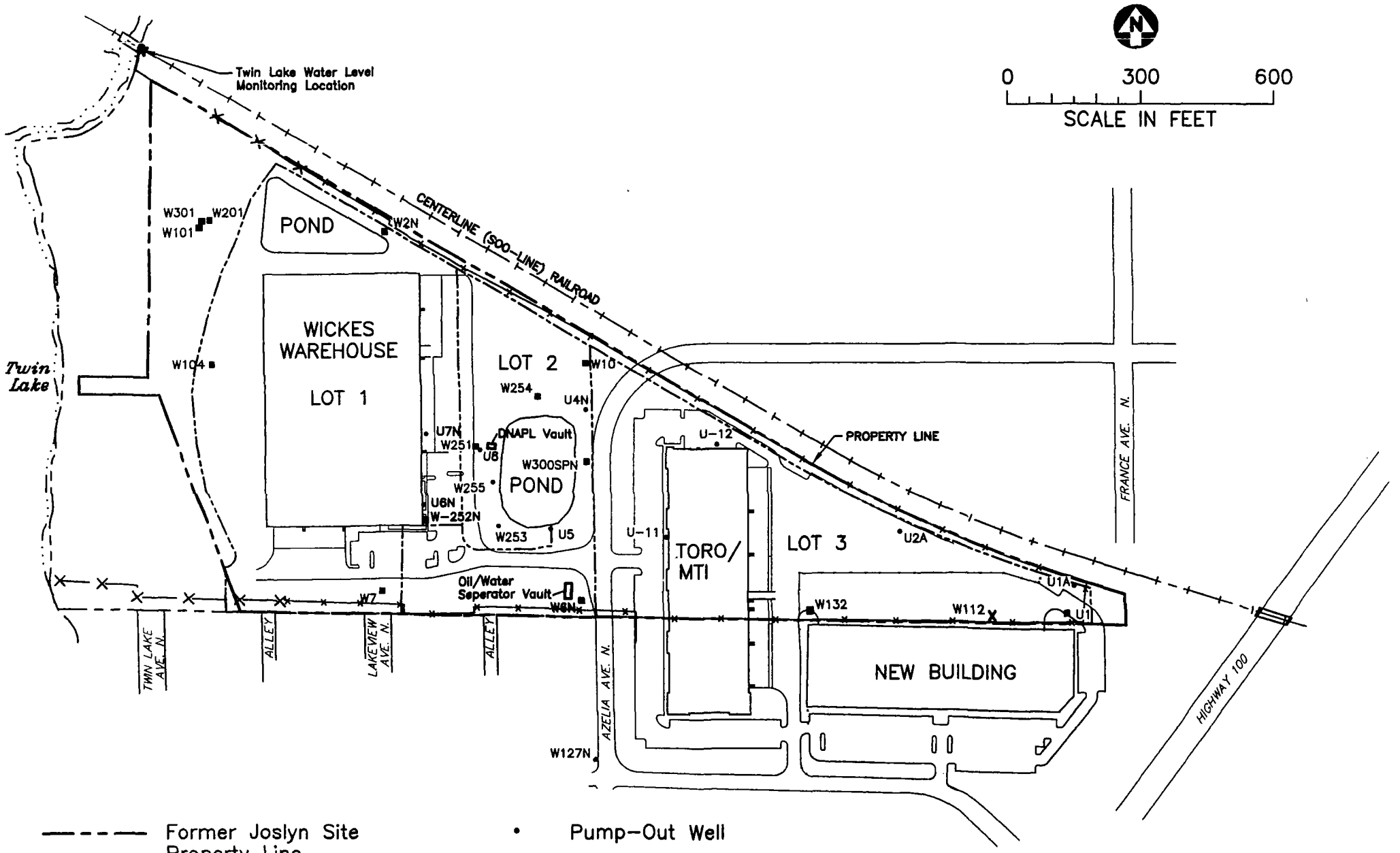


Figure 1

LOCATION OF JOSLYN SITE

P:\2327\1110\GRAPHICS\SITELOCATION.CDR RLG 06-09-04

rig M:\CAD\2327110\20104_1.DWG Plot at 300 06/10/2004 09:34:15



Former Joslyn Site Property Line

Security Fence

Completed Fencing

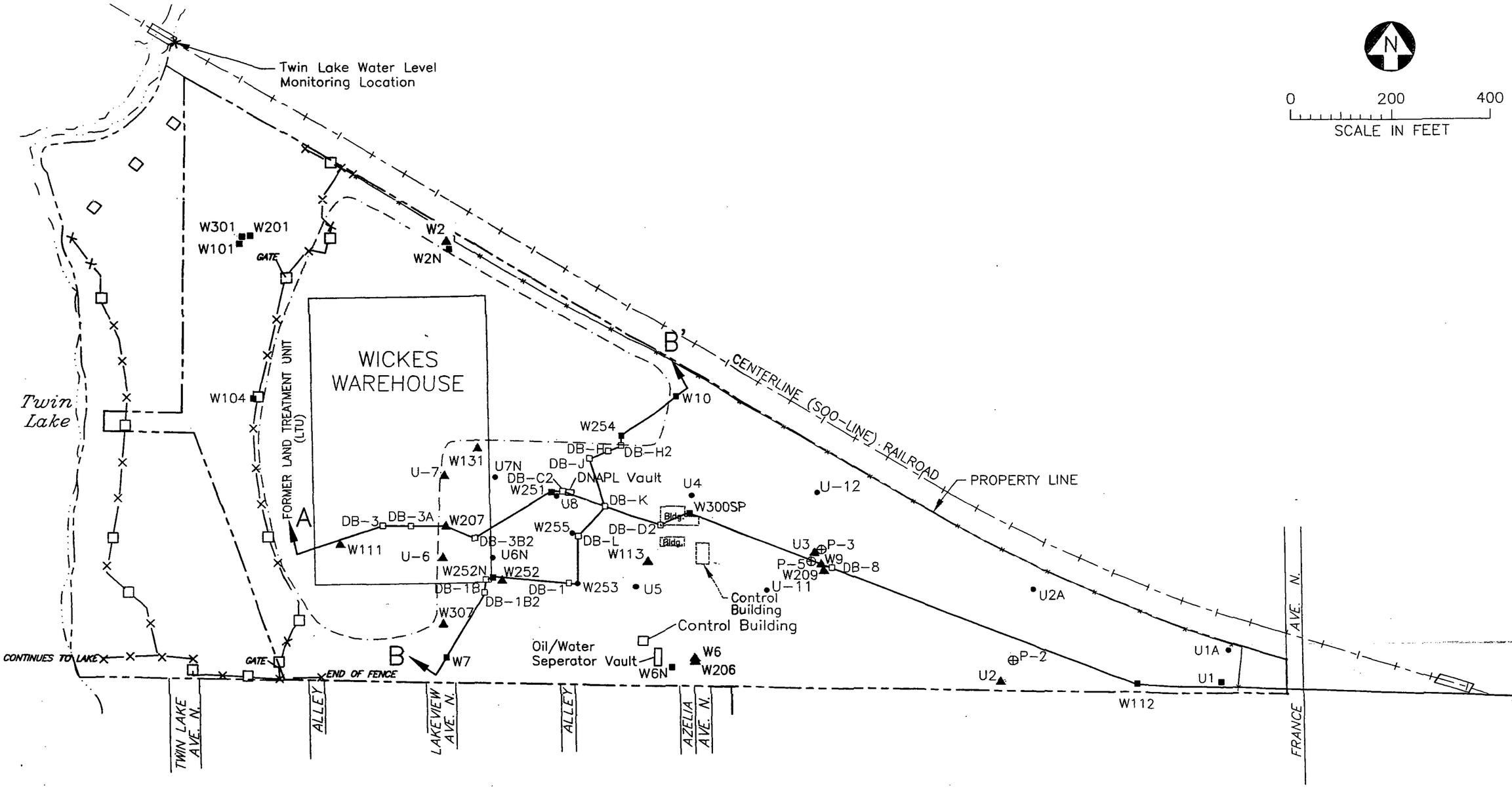
• Pump-Out Well

■ Monitoring Well

x Abandoned in 2003

Figure 2

SITE MAP



Former Site Features

Property Line

Posted Signs/Security Fence

Pump-Out Well

Monitoring Well

Piezometers

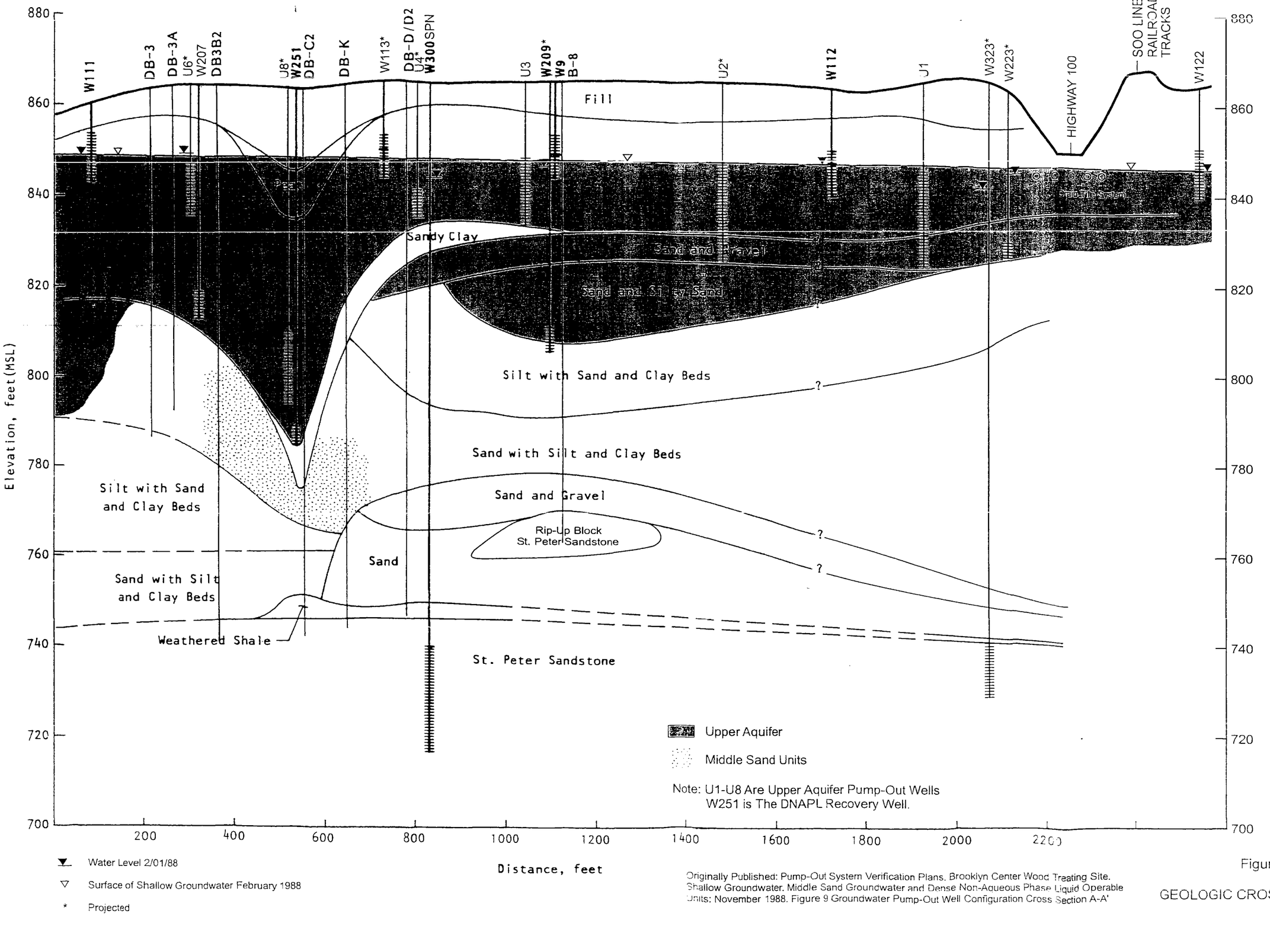
Abandoned Wells

Abandoned Piezometers

Figure 3

HISTORICAL
ON-SITE
MONITORING NETWORK
AND CROSS SECTION LOCATIONS

jmw M:\CAD\2327110\20088_1.DWG Plot at 200 06/09/2004 13:56:31

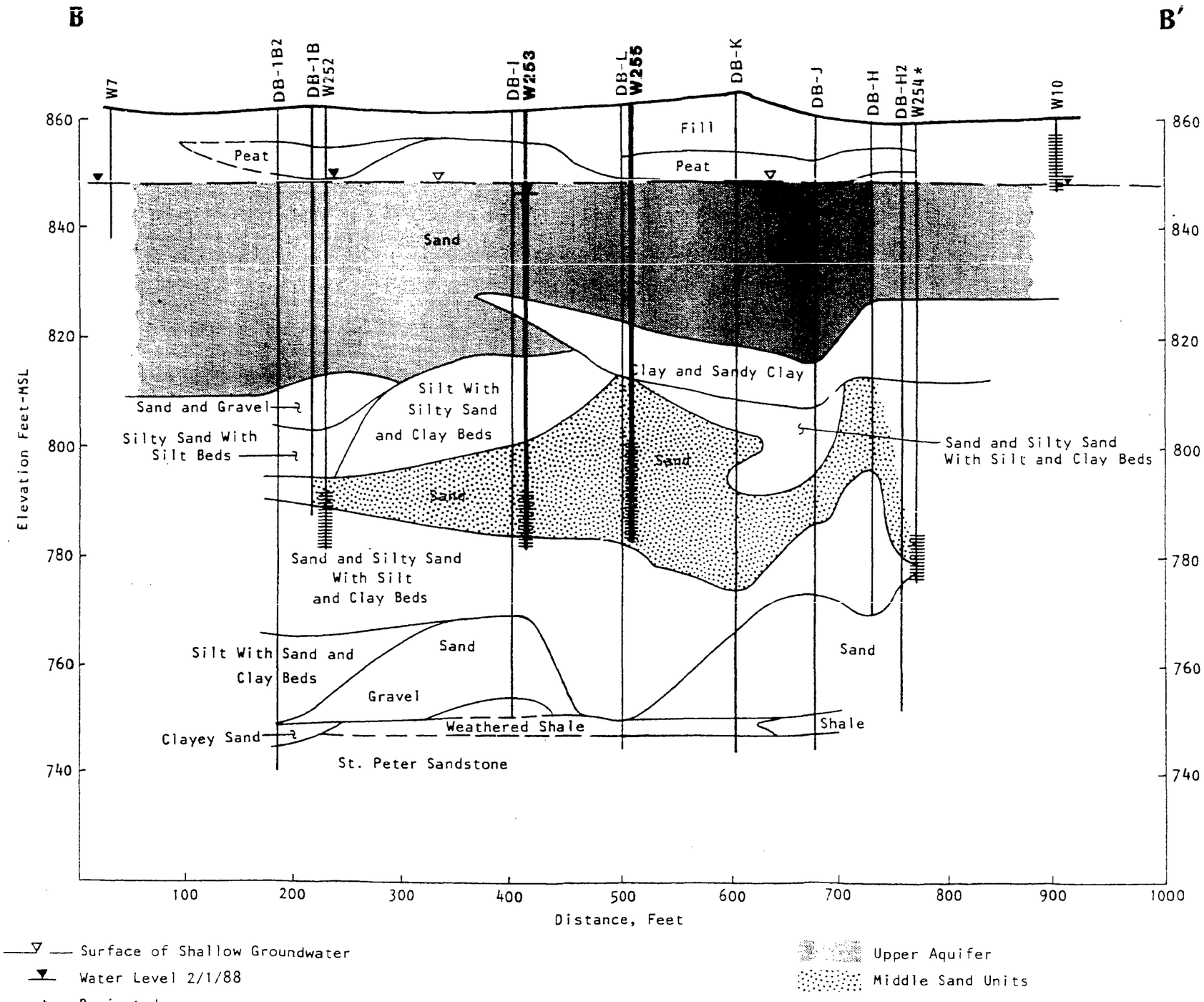


P:\2327\1110\Graphics\GeologicCrossSectionAA CDR RLG 06-09-04

Originally Published: Pump-Out System Verification Plans, Brooklyn Center Wood Treating Site. Shallow Groundwater, Middle Sand Groundwater and Dense Non-Aqueous Phase Liquid Operable Units: November 1988. Figure 9 Groundwater Pump-Out Well Configuration Cross Section A-A'

Figure 3a

GEOLOGIC CROSS-SECTION A-A'



Note: W252 & W254 Are Middle Sand Monitoring Wells
W253 & W255 Are Middle Sand Pump-out/Monitoring Wells

Originally Published: Pump-Out System Verification Plans. Brooklyn Center Wood Treatment Site. Shallow Groundwater, Middle Sand Ground Water and Dense Non Aqueous Phase Liquid Operable Units: November 1988 Figure 10 Groundwater Pump-Out Well Configuration Cross Section B-B'

Figure 3b

GEOLOGIC CROSS-SECTION B-B'

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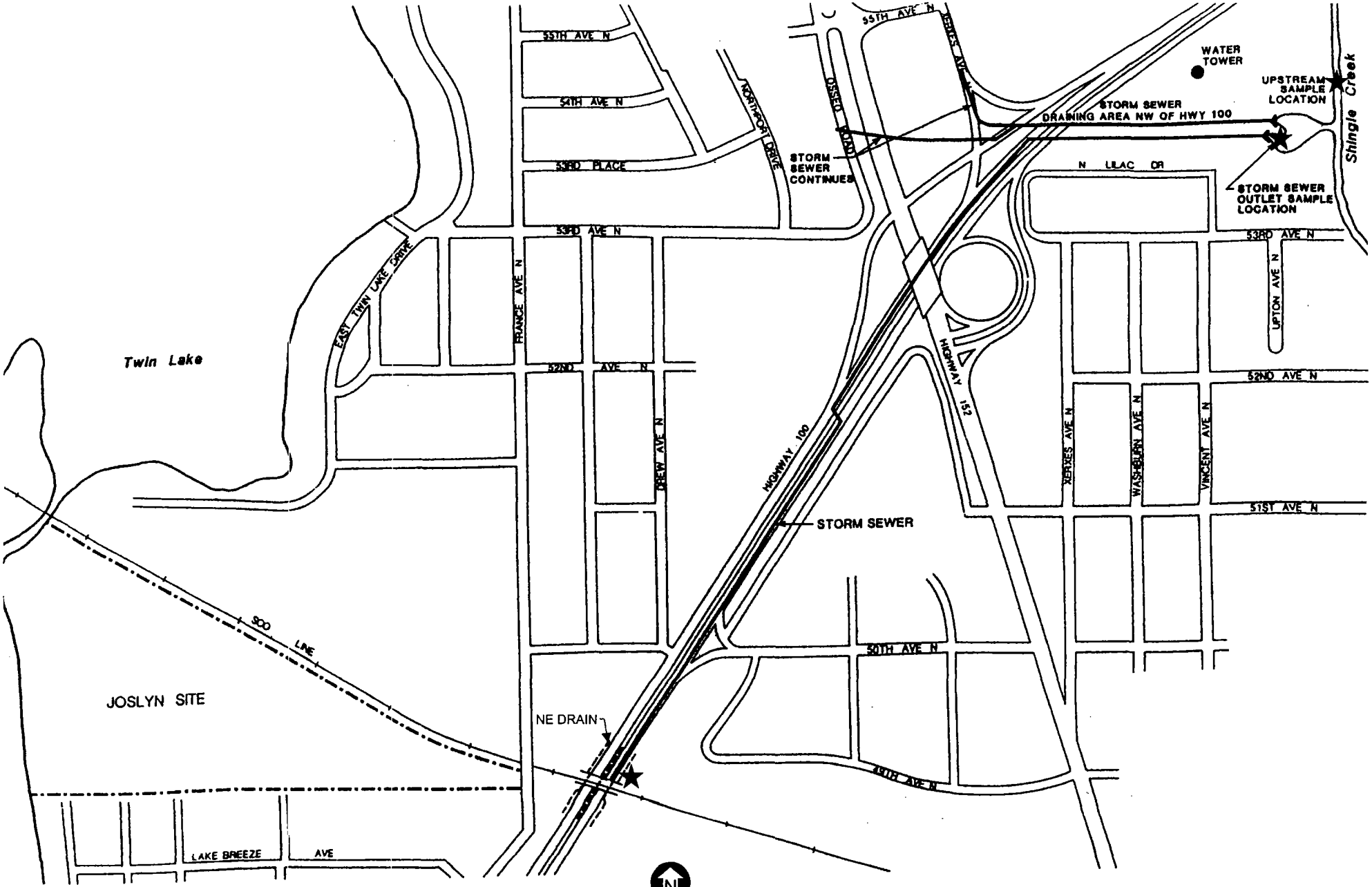
P:23\27\110\GRAPHICS\STORMSEWERSERVICEAREA.CDR RLG 06-09-04

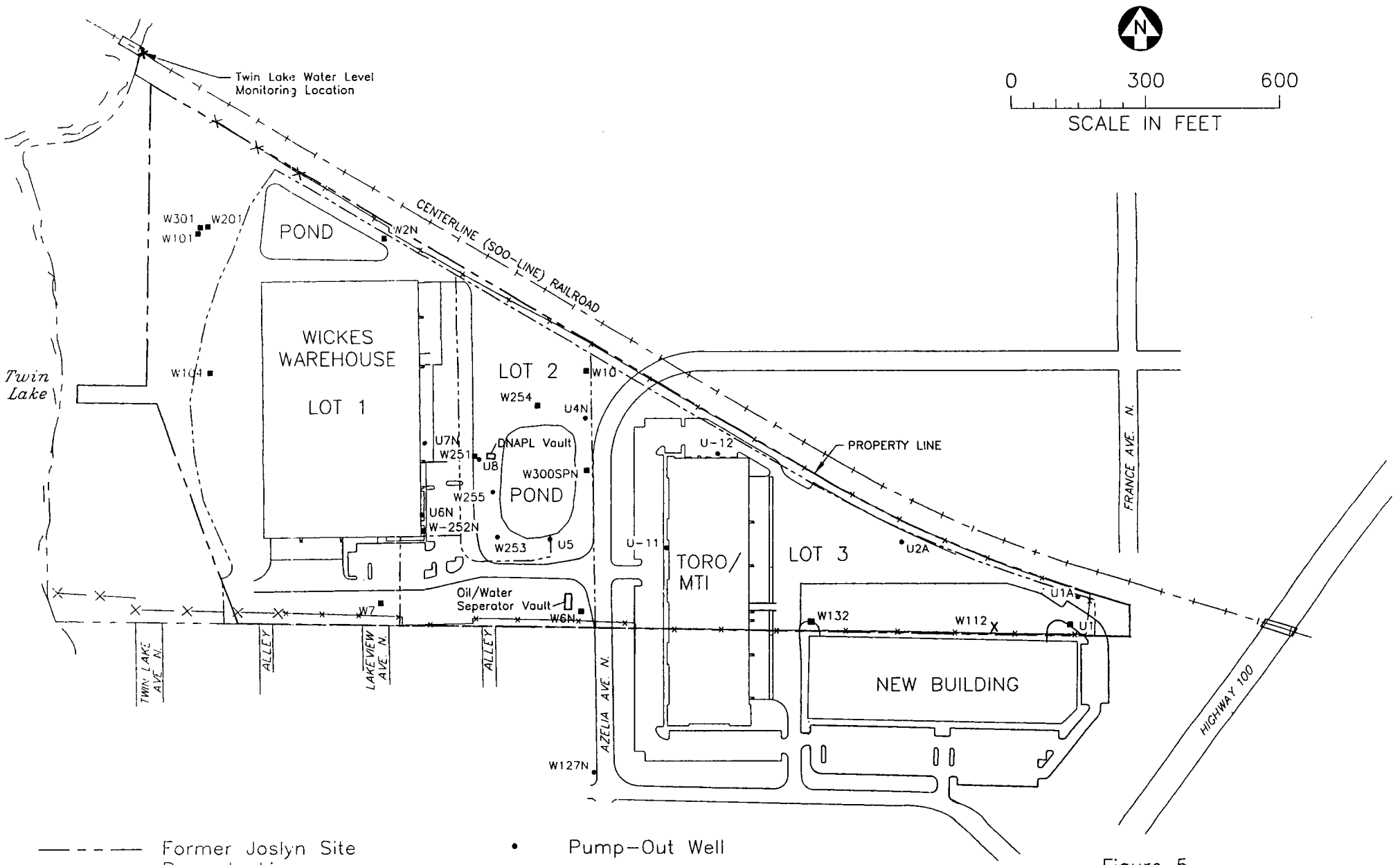


★ Surface Water Sampling Points

Figure 4

LOCATION OF STORM SEWER FROM NE DRAIN TO THE OUTLET AT SHINGLE CREEK

jmw M:\CAD\2327110\20089_1.DWG Plot at 300 06/09/2004 13:58:23



Former Joslyn Site Property Line

Security Fence

Completed Fencing

• Pump-Out Well

■ Monitoring Well

x Abandoned in 2003

Figure 5

2003
ON-SITE
MONITORING NETWORK

jmw M:\CAD\2327110\20090_1.DWG Plot at 500 06/09/2004 14:00:36

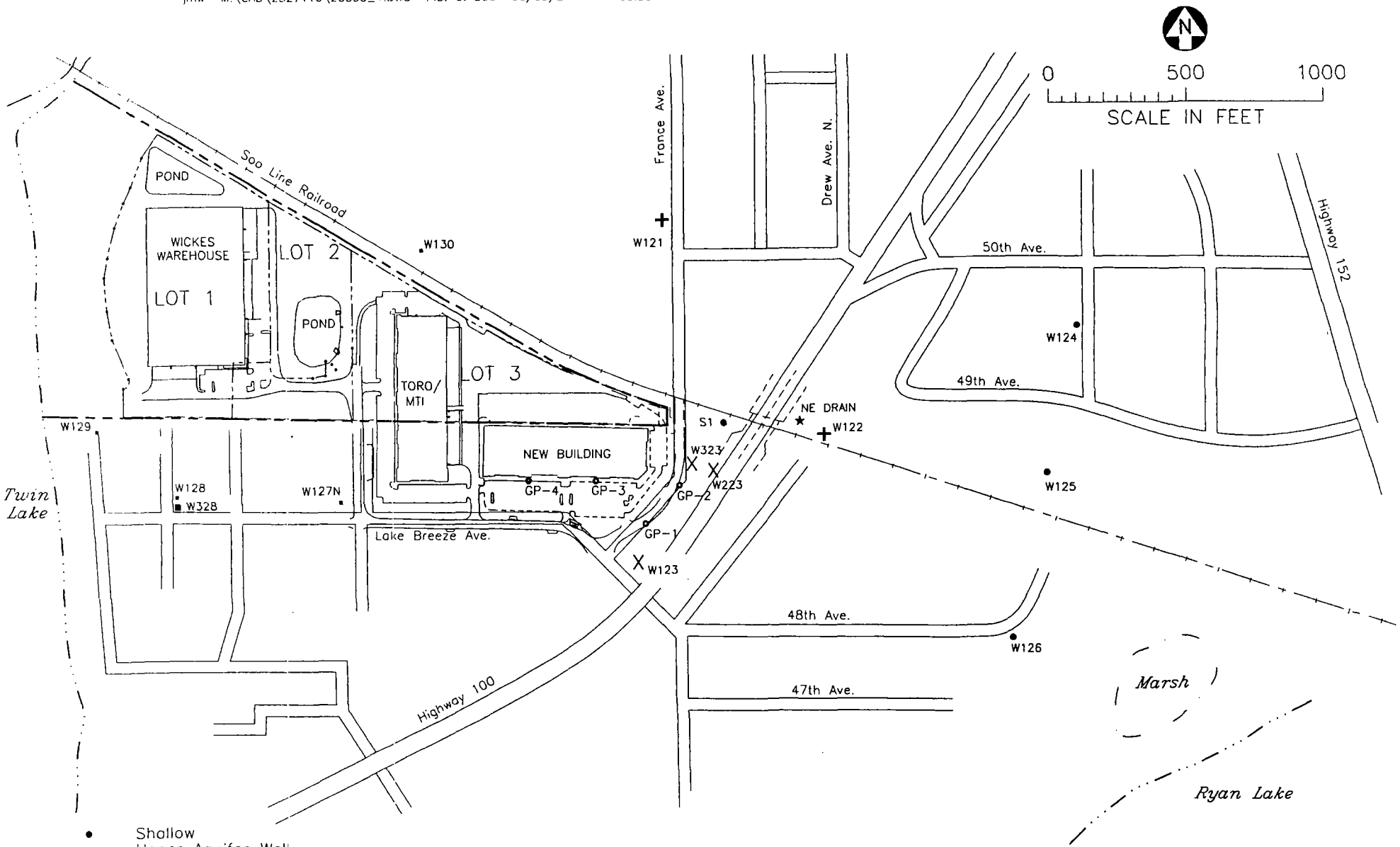


Figure 6

2003
OFF-SITE
MONITORING NETWORK

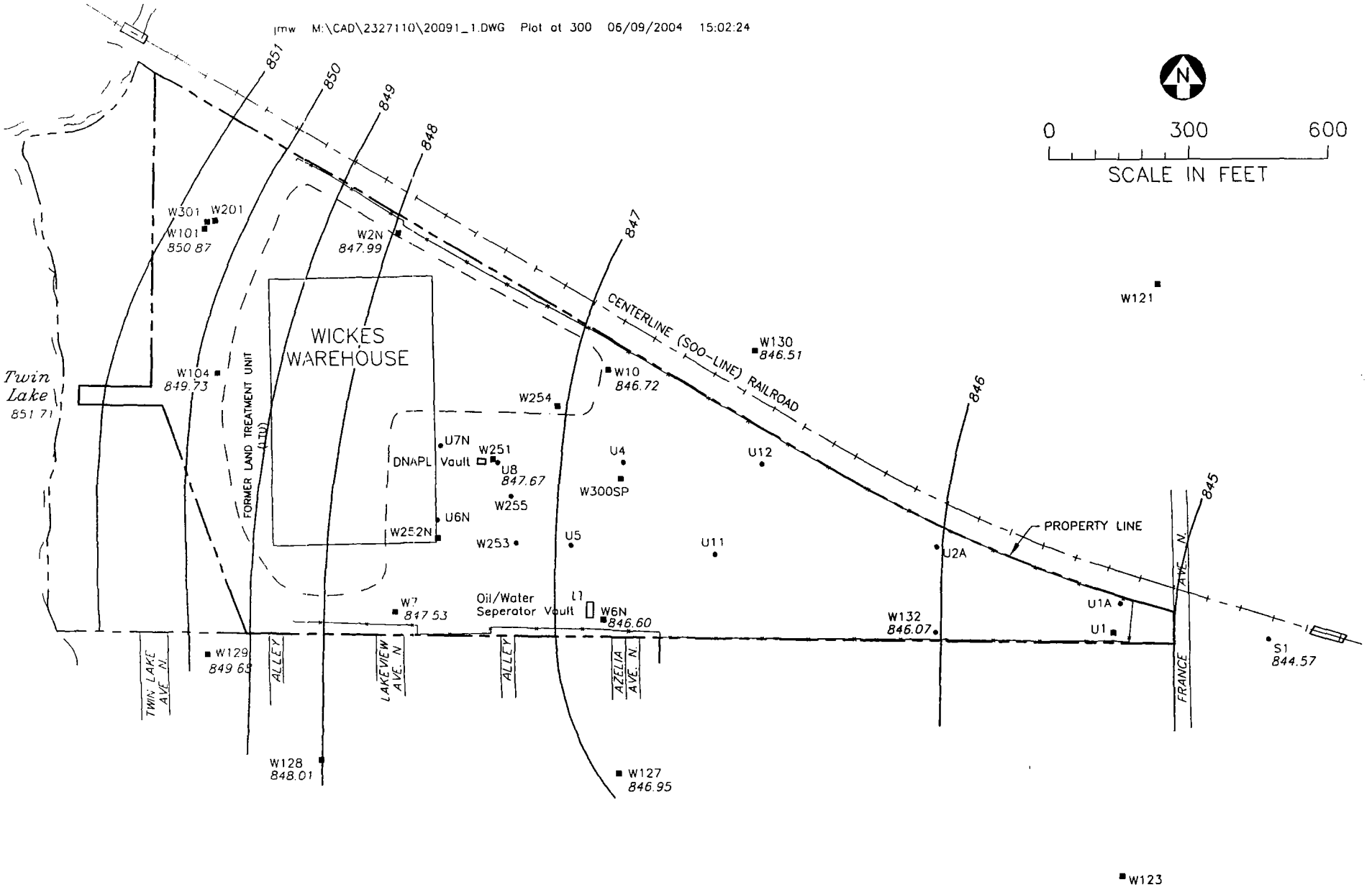
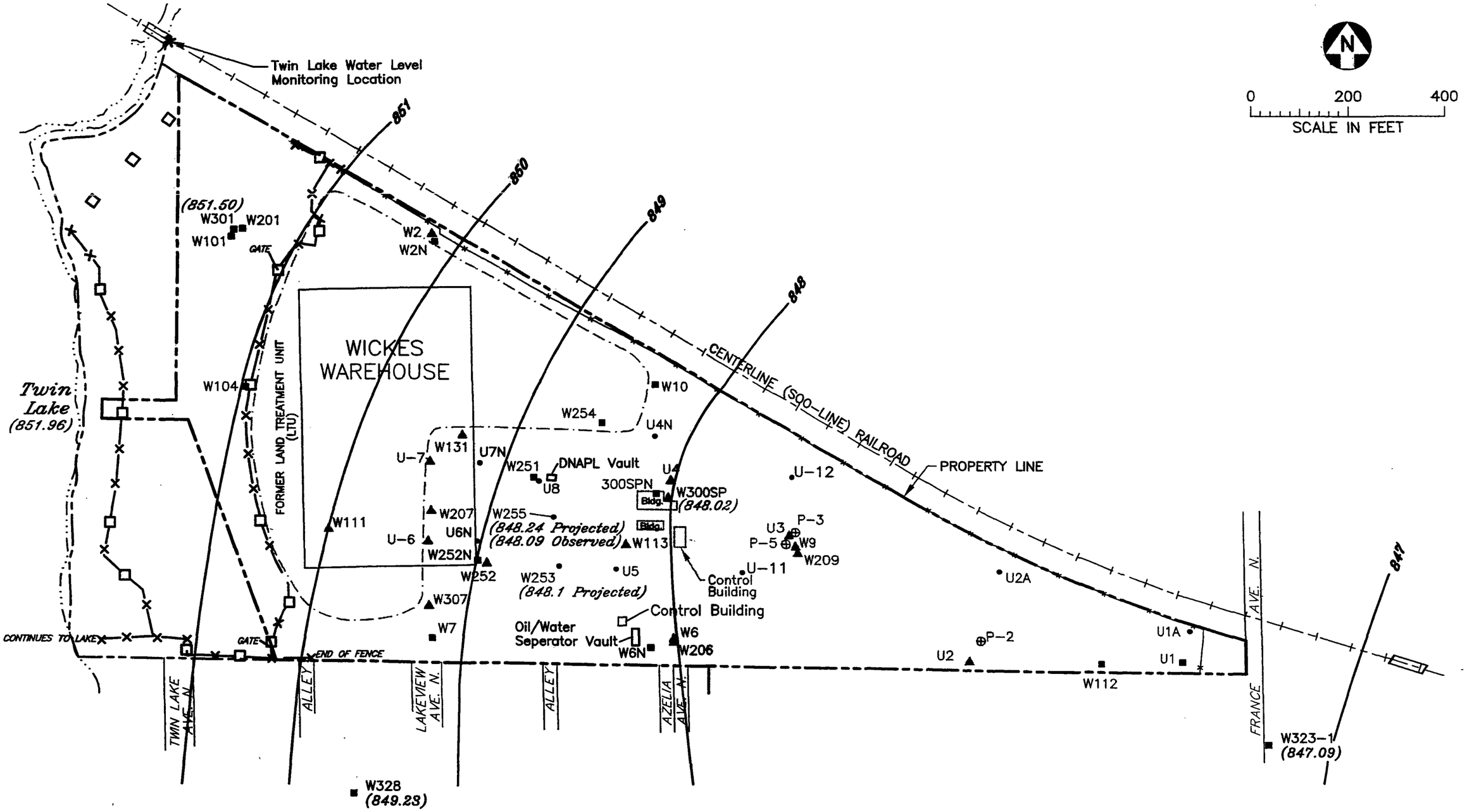


Figure 7

WATER TABLE MAP
December 16, 2003
(Contours in Feet, MSL)



NOTE: 300SP and W4 Were Abandoned in 2002 to Enable Azelia Avenue to be Extended

Former Site Features

Property Line

Posted Signs/Security Fence

• Pump-Out Well

■ Monitoring Well

▲ Abandoned Wells

⊕ Abandoned Piezometers

(848.24 Projected) – Potentiometric Level in Lower Aquifer

(848.09 Observed) – Potentiometric Level in Middle Sand

Figure 8

LOWER AQUIFER POTENTIOMETRIC SURFACE IN JUNE 2003

jmw M:\CAD\2327110\20092_1.DWG Plot at 200 06/09/2004 14:04:47

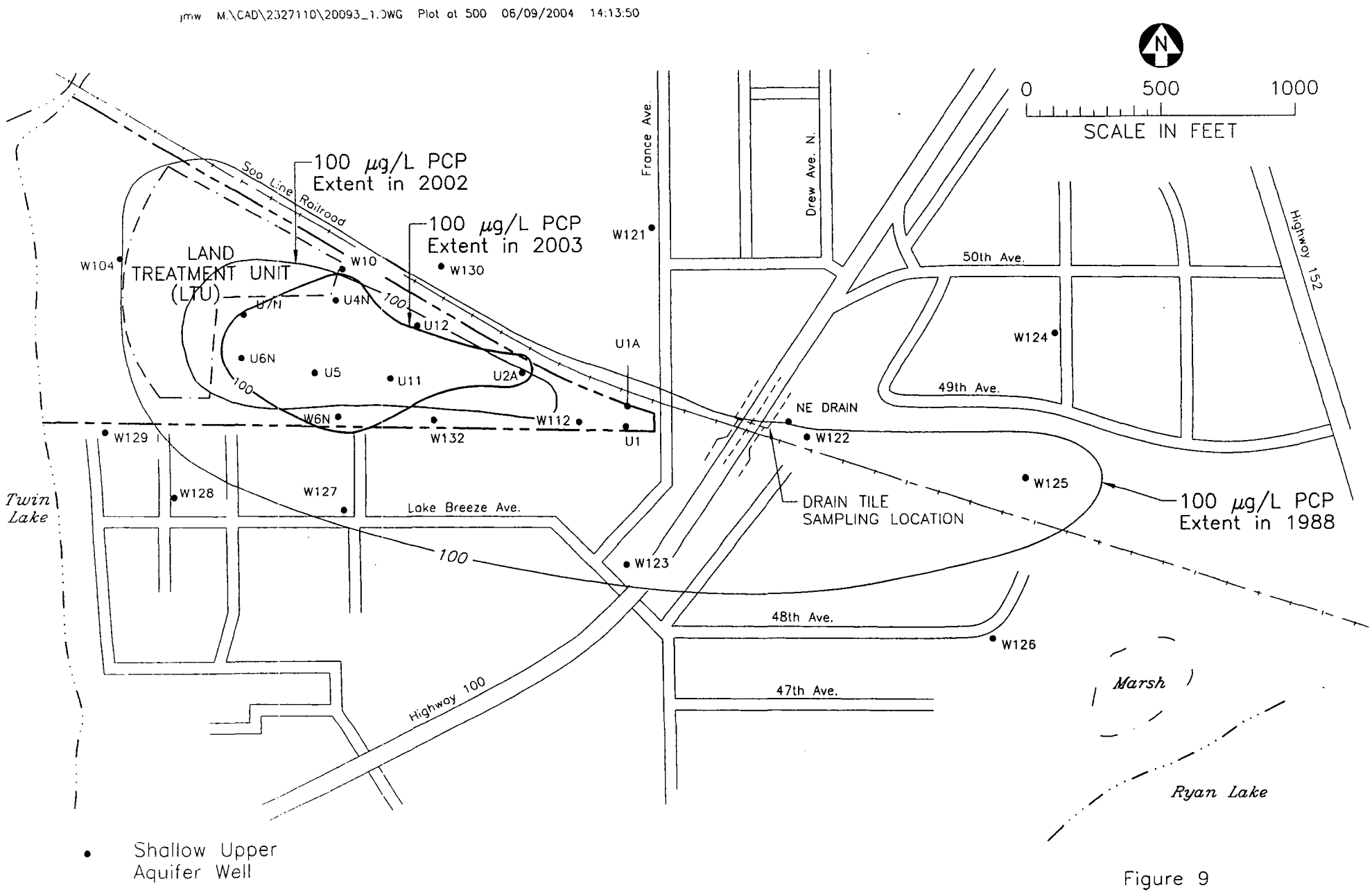


Figure 9

DECREASE IN EXTENT OF
PCP PLUME
1988 TO 2003
Upper Portion of Upper Aquifer

jmw M:\CAD\2327110\20094_1.DWG Plot at 300 06/09/2004 14:17:05

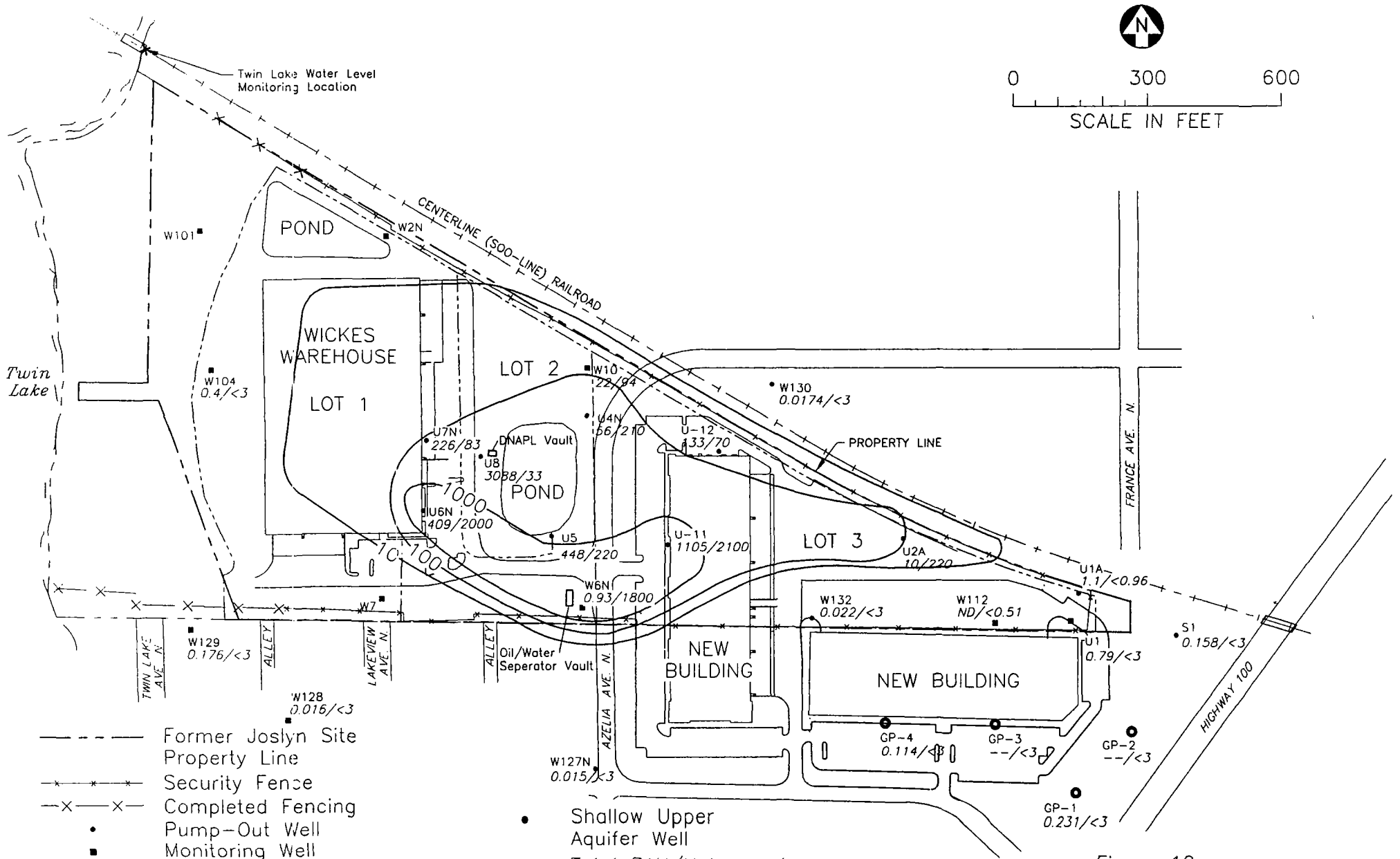
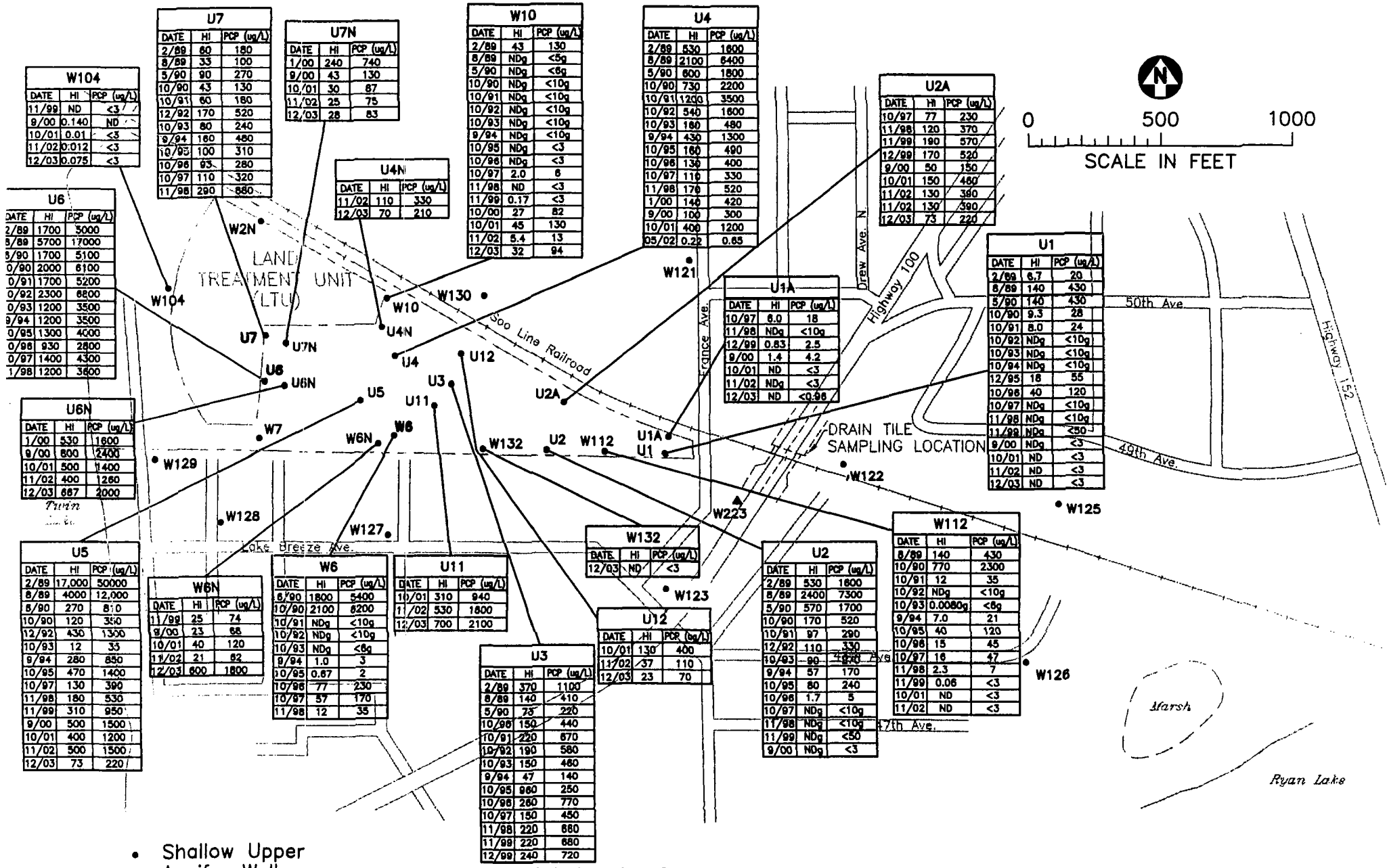


Figure 10

2003
PAH AND PENTACHLOROPHENOL CONCENTRATIONS
Upper Portion of Upper Aquifer



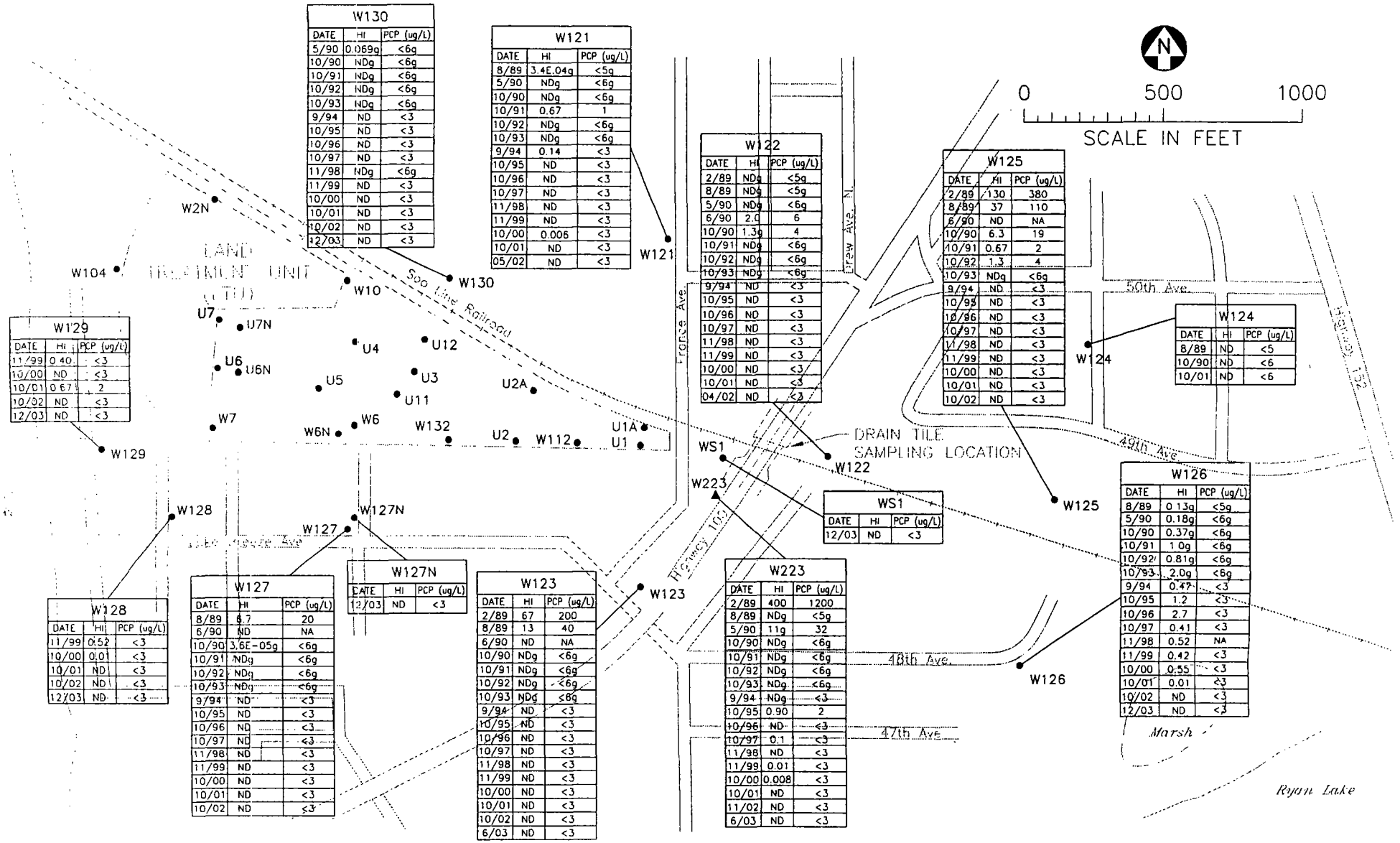
- • Shallow Upper Aquifer Well
- ▲ Mid-Depth Upper Aquifer Well
- ND Not Detected
- NA Not Applicable

HI Hazard Index for Substances or Chemicals With a Toxic Endpoint of Cancer as Specified in Part 4714.7650 (See Table A-4)

g Method Detection Limit Greater Than the Associated Standard or Criterion

Figure 11

HISTORICAL GROUNDWATER QUALITY
SELECTED ONSITE UPPER AQUIFER WELLS
DURING PUMP-OUT SYSTEM OPERATION
Upper Portion of Upper Aquifer



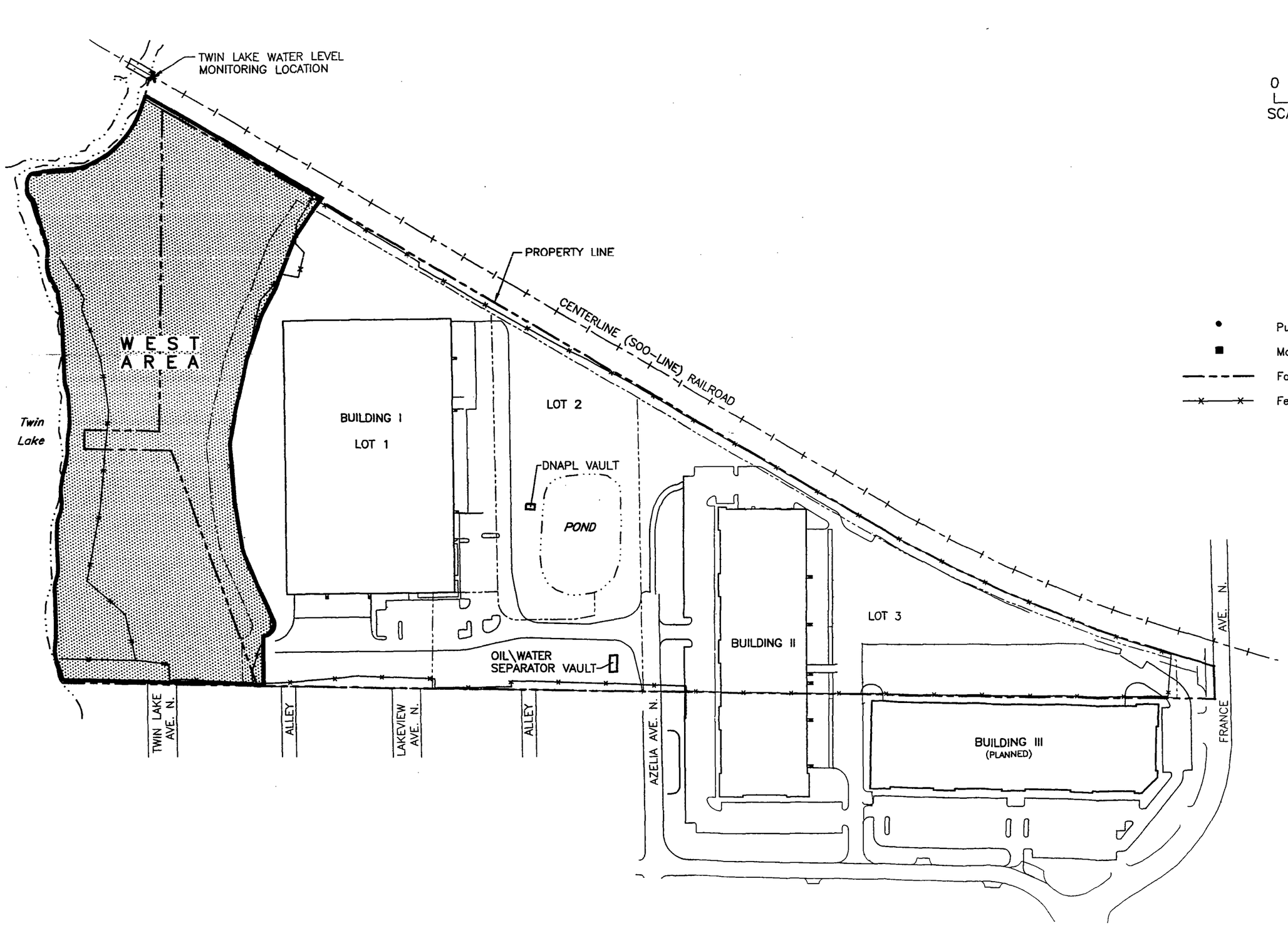
- • Shallow Upper Aquifer Well
- ▲ Mid-Depth Upper Aquifer Well
- ND Not Detected
- NA Not Applicable

HI Hazard Index for Substances or Chemicals With a Toxic Endpoint of Cancer as Specified in Part 4714.7650 (See Table A-4)

g Method Detection Limit Greater Than the Associated Standard or Criterion

Figure 12

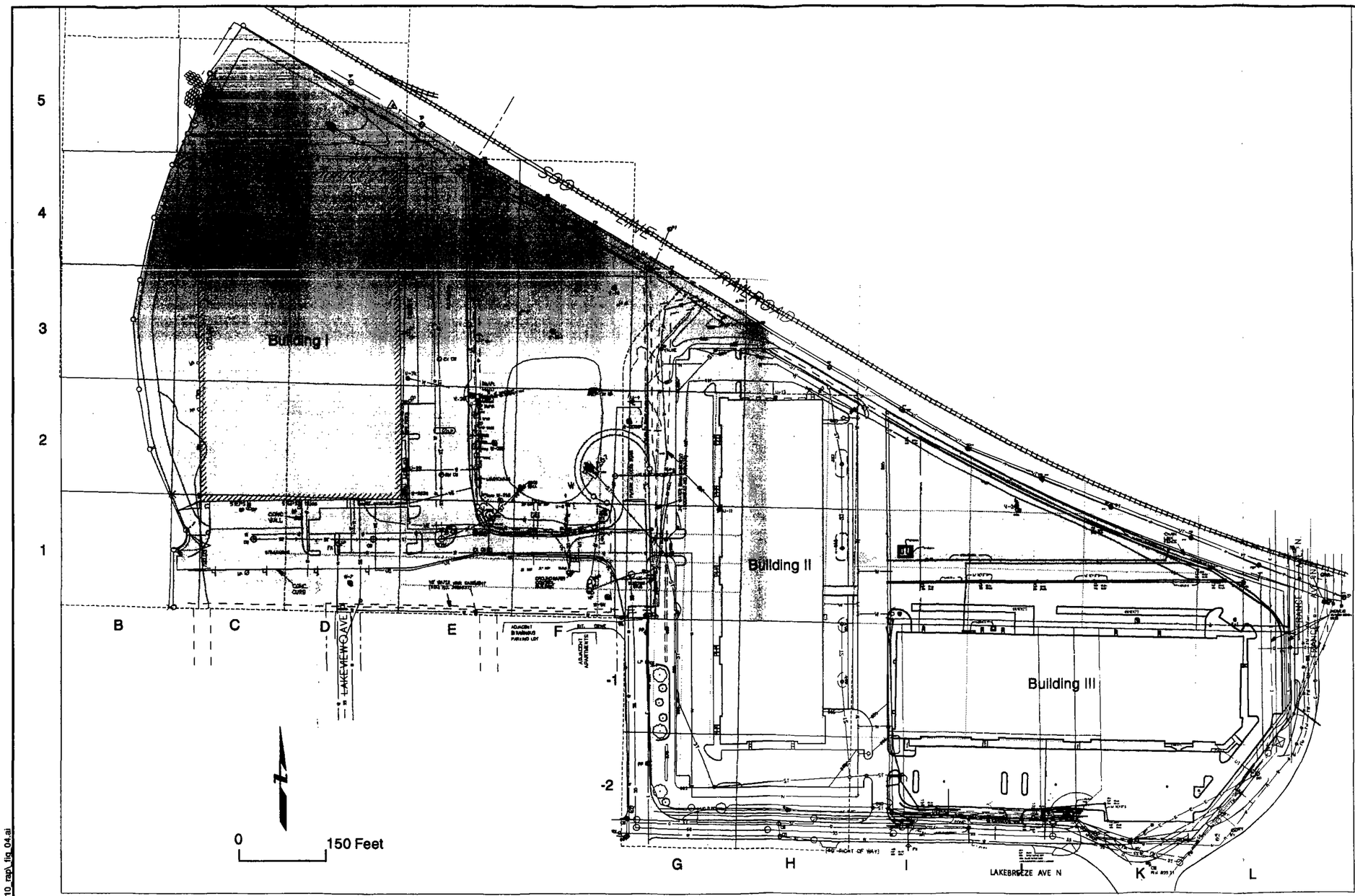
HISTORICAL GROUNDWATER QUALITY
SELECTED OFFSITE UPPER AQUIFER WELLS
DURING PUMP-OUT SYSTEM OPERATION
Upper Portion of Upper Aquifer



rlg M:\CAD\2327110\20096_1.DWG Plot at 1 06/10/2004 09:57:28

Figure 13

WEST AREA



EXPLANATION

Permanent Cover

Site Grid System Example:

200'

200'

2

C

Notes:

1) Base map courtesy of Sunde Land Surveying, LLC., revised January 30, 2004.

2) Do not use this drawing to locate site utilities.

PERMANENT SITE COVER STATUS
Response Action Plan Implementation - Building III
Joslyn Site
Brooklyn Center, Minnesota

GEOMATRIX	Project No. 5345.000	Figure 14

S:\5300\5345\5345.000\a\04_0210_rap_fig_04.ai

APPENDIX B

Table 1
Summary of Ground Water ARARs and TBCs
Joslyn Manufacturing Company Site
Brooklyn Center, Minnesota

1989 Record of Decision

Parameter	Cleanup Criteria	Concentration Limit
Pentachlorophenol	MCL/RAL	220 ug/l
cPAHs	RAL	0.028 ug/l
nPAHs	RAL	0.28 ug/l

Based on parameters and cleanup criteria presented in the 1989 ROD
MCL - Maximum contaminant level as established by the EPA
RAL - Recommended allowable limit as established by the MDH
cPAHs – Carcinogen polynuclear aromatic hydrocarbons as defined by MDH
nPAHs – Noncarcinogenic polynuclear aromatic hydrocarbons as defined by MDH

2004 Five-Year Review

Chemical	CAS No.	HRL Value (ug/l)	HBV Value (ug/l)	B(a)P Equiv. Factor
Pentachlorophenol	87-86-5	3.0	None	None
Carcinogenic PAHs				
Benzo(a)anthracene	56-55-3	None	*	0.1
Benzo(b)fluoranthene	205-99-2	None	*	0.1
Benzo(j)fluoranthene	205-82-3	None	*	0.1
Benzo(k)fluoranthene	207-08-9	None	*	0.1
Benzo(a)pyrene	50-32-8	None	0.05	1
Chrysene	218-01-9	None	*	0.01
Dibenz(a,j)acridine	224-42-0	None	*	0.1
Dibenz(a,h)acridine	226-36-8	None	*	0.1
Dibenz(a,h)anthracene	53-70-3	None	*	0.56
7H-Dibenzo(c,g)carbazole	194-59-2	None	*	1
Dibenzo(a,e)pyrene	192-65-4	None	*	1
Dibenzo(a,h)pyrene	189-64-0	None	*	10
Dibenzo(a,i)pyrene	189-55-9	None	*	10
Dibenzo(a,l)pyrene	191-30-0	None	*	10
7,12-Dimethylbenzanthracene	57-97-6	None	*	34
1,6-Dinitropyrene	42397-64-8	None	*	10
1,8-Dinitropyrene	42397-65-9	None	*	1
Indeno(1,2,3-c,d)pyrene	193-39-5	None	*	0.1
3-Methylcholanthrene	56-49-5	None	*	3
5-Methylchrysene	3351-31-3	None	*	1
5-Nitroacenaphthene	602-87-9	None	*	0.02
1-Nitropyrene	5522-43-0	None	*	0.1
4-Nitropyrene	57835-92-4	None	*	0.1
6-Nitrochrysene	7496-02-8	None	*	10
2-Nitrofluorene	607-57-8	None	*	0.01
Noncarcinogenic PAHs				
Acenaphthene	83-32-9	400	None	None
Acenaphthylene	208-96-8	None	None	None
Anthracene	120-12-7	2,000	None	None
Fluoranthene	206-44-0	300	None	None
Fluorene	86-73-7	300	None	None
Naphthalene	91-20-3	300	None	None
Pyrene	129-00-0	200	None	None
Benzo(g,h,i)perylene	191-24-2	None	None	None
Phenanthrene	85-02-8	None	None	None

* - HBV values do not exist for individual cPAHs. Need to multiple the detected concentration times the B(a)P equivalency factor to get the calculated concentration for each individual cPAH. The sum of the cPAH concentrations is compared to the HBV value of 0.05 ug/l for benzo(a)pyrene.

Table 2
Summary of Surface Water ARARs and TBCs
Joslyn Manufacturing and Supply Company
Brooklyn Center, Minnesota

1989 Record of Decision

Parameter	Criteria	Concentration Limit (ug/l)
Pentachlorophenol	SSWC	5/7.8 [1]
cPAHs	SSWC	0.07
nPAHs	SSWC	0.17

SSWC - Site-specific surface water criterion - human health based aquatic life criteria to protect humans from potential adverse effects of eating fish.
cPAHs - Carcinogenic polynuclear aromatic hydrocarbons as defined by MDH
nPAHs - Non-carcinogenic polynuclear aromatic hydrocarbons as defined by MDH
ug/l - Micrograms per liter
[1] - The value appears to have been incorrectly listed in the ROD. It is interpreted as 5.7 ug/l at pH of 7.0.

Five-Year Review

Chemical	Criteria	Concentration Limit (ug/l)
Pentachlorophenol	ALS	5.5 [2]
Acenaphthene	ALS	20.0
Anthracene	ALS	0.035
Fluoranthene	ALS	1.9
Phenanthene	ALS	3.6
Naphthalene	ALS	81
Benzo(a)pyrene	SSWC	0.00051 [3]

ALS - Aquatic Life Standard. Chronic standard from MN Rules Chapter 7050 (2000 revision). The chronic standard is defined as the highest water concentration of a toxicant to which organisms can be exposed without causing chronic toxicity.
[2] - pH dependent standard - value listed is for pH of 7.0.
[3] Site-specific surface water criterion specified by the MPCA as 0.00051 ug/l in the 1999 five-year review.

Table 3
Soil Biological Treatment - Land Treatment Unit
Joslyn Manufacturing and Supply Company
Brooklyn Center, Minnesota

	Volume of Soil Treated (cubic yards)	Placement Date	Treatment Completion Date
TL1*	17,000	1989	1990
TL2	20,700	1990	1992
TL3	24,000	1992	1994
TL4	14,000	1994	1995
TL5	8,400	1996	1997
Windrow	1,200	1997	1998

* - means Treatment Lift 1

Table 4
2003 Water Quality Data
Pumpout System Effluent
(concentrations in ug/L, unless noted otherwise)
Joslyn Manufacturing Company Site
Brooklyn Center, MN

Location Date	Effluent 2/4/2003	Effluent 3/3/2003	Effluent 4/1/2003	Effluent 5/2/2003	Effluent 6/7/2003	Effluent 7/2/2003	Effluent 8/4/2003	Effluent 9/3/2003	Effluent 10/13/2003	Effluent 11/3/2003
General Parameters										
Chemical Oxygen Demand, mg/L	**26**	**22**	**20**	**18**	**13**	**18**	**19**	**22**	**27**	**23**
Oil and Grease, mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5	<5.0
Solids, total suspended, mg/L	**7**	**12**	**5**	<5	<5	**5**	<5	**7**	<5	<5
pH, standard units	**7.23**	**7.18**	**7.47**	**7.44**	**7.89**	**7.24**	**6.14**	**7.24**	**7.22**	**7.12**
SVOCs										
2-Methylnaphthalene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	**18**	<10
Acenaphthene	**69**	**65**	**63**	**55**	**50**	**72**	**54**	**55**	**69**	**74**
Acenaphthylene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Anthracene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Benzo(a)anthracene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Benzo(a)pyrene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Benzo(b)fluoranthene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Benzo(g,h,i)perylene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Benzo(k)fluoranthene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Chrysene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Dibenz(a,h)anthracene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Fluoranthene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Fluorene	**32**	**27**	**30**	**25**	**18**	**27**	**25**	**26**	**33**	**35**
Indeno(1,2,3-cd)pyrene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10
Naphthalene	**22**	<10	<10	**12**	<10	**46**	<9.7	<10	**310**	**33**
Pentachlorophenol	**590**	**580**	**540**	**550**	**620**	**610**	**500**	**490**	**790**	**780**
Phenanthrene	**21**	<10	**18**	**14**	<10	**18**	<9.7	**11**	**30**	**21**
Pyrene	<9.7	<10	<10	<10	<10	<10	<9.7	<10	<9.7	<10

Detections are presented in bold.

Note: The MCES permit required the effluent contain less than 3 mg/L (3000 ug/L) of any single toxic organic compound and less than 10 mg/L of all toxic organic compounds combined.

Table 5
2003 and Historical Summary PCP and PAH Removal by DNAPL Recovery System
Joslyn Manufacturing Company Site
Brooklyn Center, MN

Year	Volume DNAPL Removed (gallons)	Weight DNAPL Removed (pounds)	Total cPAH Concentration (mg/L)	Weight of cPAHs Removed (lbs.)	Total PAH Concentration (mg/L)	Weight of PAHs Removed (lbs.)	PCP Concentration (mg/L)	Weight of PCP Removed (lbs.)
2003	1,515	13,789	20,600	239	171,300	1,986	170	1.97
2002	1,928	17,548	20,600	304	171,300	2,527	170	2.51
2001	2,026	18,440	20,600	319	171,300	2,655	170	2.64
2000	1,045	9,511	20,600	165	171,300	1,370	170	1.36
1999	1,258	11,450	20,600	198	171,300	1,649	170	1.64
1998	1,712	15,582	20,600	270	171,300	2,244	170	2.23
1997	1,205	10,967	20,600	190	171,300	1,579	170	1.57
1996	78	710	20,600	12	171,300	102	170	0.10
Cumulative Amount Removed	10,767	97,996		1,697		14,112		14

Note: 1) Concentrations are taken from 1987 and 1989 DNAPL analyses.
2) DNAPL Specific Gravity = 1.09
3) Weight of PAHs based on EPA method 8270 analysis. Remaining mass of DNAPL made up of other organic compounds.
4) cPAHs are as follows: benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, indeno(123cd)pyrene. and dibenzo(ah)anthracene

Table 6
2003 Water Quality Data
Comparison to Aquatic Life Standards
Joslyn Manufacturing and Supply Company
Brooklyn Center, Minnesota

	Aquatic Life Standard [1]	Storm Sewer Outlet 6/7/2003	Storm Sewer Outlet 12/18/2003	Upstream at Shingle Creek 6/7/2003	Upstream at Shingle Creek 12/18/2003	Upstream at Shingle Creek (Duplicate) 12/18/2003	Northeast Drain 3/3/2003	Northeast Drain 6/7/2003
Carcinogenic PAHs								
Benzo(a)pyrene	0.00051 [2]	**0.049**	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034
Non-carcinogenic PAHs								
Acenaphthene	20	0.0059	0.071	0.0050	0.0050	0.0056	0.078	0.043
Anthracene	0.035	0.012	0.0035	0.0065	<0.0034	<0.0034	0.012	0.012
Fluoranthene	1.9	0.26	0.020	0.056	0.013	0.015	0.014	0.011
Naphthalene	81	0.0097b	0.013b	0.0067b	0.013b	0.014b	0.013	0.028b
Phenanthrene	3.6	0.064	0.010b	0.022	0.0078b	0.0097b	0.013	0.017
Pentachlorophenol	5.5 [3]	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
pH, (standard units)	NA	-	7.42	-	7.88	-	-	-

Concentrations are reported as micrograms per liter (ug/l) unless otherwise noted.

[1] Aquatic Life Standard. Chronic standard from MN Rules Chaper 7050 (2000 revision).

[2] Site-specific Surface Water Criteria

[3] pH dependent - value listed for a pH of 7.0

\- Not analyzed

b Potential false positive value based on blank data validation procedures.

Bolded value indicates an exceedance.

< Means "less than"

Table 7
2003 Water Quality Data
MnDOT Results for Well S-1
(concentrations in ug/L, unless noted otherwise)
Joslyn Manufacturing Company Site
Brooklyn Center, MN

Location	S-1	S-1	S-1	S-1	S-1	S-1	S-1	S-1	S-1	S-1	S-1	S-1	S-1	S-1
Date	7/14/2003	8/1/2003	9/4/2003	9/15/2003	9/22/2003	9/27/2003	10/1/2003	10/8/2003	10/13/2003	10/24/2003	10/30/2003	11/5/2003	11/14/2003	12/4/2003
Lab	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech	EnecoTech
Dissolved oxygen, mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH, standard units	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Redox (oxidation potential), mV	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Specific Conductance umhos@ 25oC	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Temperature, degrees C	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Turbidity, NTU	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	<10	<0.53	<0.54	<0.55	<0.53	<0.51	--	--	--	<0.51	<0.52	<0.050	<0.50	<0.54
Acenaphthylene	<10	<1.1	<1.1	<1.1	<1.1	<1.0	--	--	--	<1.0	<1.0	<1.0	<1.0	<1.1
Anthracene	<10	**0.12**	**0.091**	<0.055	<0.053	<0.051	--	--	--	<0.051	<0.052	<0.050	**0.17**	**0.16**
Benzo(a)anthracene	<10	<0.053	<0.054	<0.055	<0.053	<0.051	--	--	--	<0.051	<0.052	<0.050	<0.050	<0.054
Benzo(a)pyrene	<10	<0.053	<0.054	<0.055	<0.053	<0.051	--	--	--	<0.051	<0.052	<0.050	<0.050	<0.054
Benzo(b)fluoranthene	<10	<0.11	<0.11	<0.11	<0.11	<0.10	--	--	--	<0.10	<0.10	<0.10	<0.10	<0.11
Benzo(g,h,i)perylene	<10	<0.11	<0.11	<0.11	<0.11	<0.10	--	--	--	<0.10	<0.10	<0.10	<0.10	<0.11
Benzo(k)fluoranthene	<10	<0.053	<0.054	<0.055	**0.053**	<0.051	--	--	--	<0.051	<0.052	<0.050	<0.050	<0.054
Chrysene	<10	<0.053	<0.054	<0.055	<0.053	<0.051	--	--	--	<0.051	<0.052	<0.050	<0.050	<0.054
Dibenz(a,h)anthracene	<10	<0.11	<0.11	<0.11	<0.11	<0.10	--	--	--	<0.10	<0.10	<0.10	<0.10	<0.11
Fluoranthene	<10	<0.11	<0.11	<0.11	<0.11	<0.10	--	--	--	<0.10	**0.13**	<0.10	<0.10	<0.11
Fluorene	<10	<0.11	<0.11	<0.11	<0.11	<0.10	--	--	--	<0.10	<0.10	<0.10	<0.10	<0.11
Indeno(1,2,3-cd)pyrene	<10	<0.053	<0.054	<0.055	<0.053	<0.051	--	--	--	<0.051	<0.052	<0.050	<0.050	<0.054
Naphthalene	<10	<0.53	<0.54	<0.55	<0.53	<0.51	--	--	--	<0.51	<0.52	<0.50	<0.50	<0.54
Pentachlorophenol	<24	<1.0	<0.51	<0.053	<0.60	<0.52	<0.53	<0.50	<0.52	<0.52	<0.51	<0.51	<0.51	<0.53
Phenanthrene	<10	<0.053	<0.054	<0.055	<0.053	<0.051	--	--	--	<0.051	<0.052	<0.050	<0.050	<0.054
Pyrene	<10	<0.053	<0.054	<0.055	<0.053	<0.051	--	--	--	<0.051	**0.082**	<0.050	<0.050	<0.054

-- Not analyzed.

b Potential false positive based on blank data validation procedure.

APPENDIX C

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